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No. 9.—SWINE FEVER AND ENTERITIS IN YOUNG PIGS

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The title of this paper, which was not of my choosing, covers such an enormous field that the limit of 5,000 words imposed on the writer would be more than used up in the discussion of swine fever alone; however, as the principal object is to stimulate discussion, and obtain free interchange of views and opinions, one will be excused if the most salient points, and those principally affecting the practitioner only are dealt with.

With this object in view, it is proposed to deal with the following conditions:—

(1) Swine fever;
(2) Infectious necrotic enteritis (so-called);
(3) Swine dysentery;
(4) Intestinal coccidiosis of swine;
(5) Tuberculous enteritis;

and follow up with a general discussion.

Swine Fever

Hutyra and Marek, in their definition of swine fever, state: "Hog cholera represents a septicæmia of swine produced by a filterable virus, in the course of which inflammatory and necrotic processes frequently develop in the intestinal canal and in the abdominal lymph glands, or in the lungs, as a result of the invasion of bacteria of the hog cholera group, or the *Bacillus suisepticus*."

This definition opens up several important questions, which will have to be considered in the course of the paper, but, in the first place, it might be as well to refresh our memories with a somewhat brief picture of the clinical and *post-mortem* appearances which we *have been* in the habit of describing as typical of the disease in this country.

The description has been under three headings, *viz.*: Peracute, Acute, and Chronic.

The *Peracute* type results from a heavy dose of virus, terminates in speedy death and frequently with no *post-mortem* lesions indicative of swine fever. The incubation period is short and death sudden and unexpected, the symptoms being those of a complete intoxication. The *post-mortem* appearances are usually prominent by their absence, or at most a general hyperæmia of the gastric and intestinal mucous membrane, or there may be some petechiation. The bowel contents are almost solid and dry.

The *Acute* type shows a high temperature with inappetence, vomition and thirst, loss of muscular power in the loins and hind quarters, peculiar sour fœtid odour from the ailing animals, rigors, uneasiness, extremities cold and discoloured, head carried low, ears drooped, tail uncurled (as a rule) and limp, rapid loss of flesh with hollow flanks, sticky catarrhal discharge from eyes and nose. There may be diarrhœa or constipation at the onset, ending in a continuous fœtid diarrhœa. A short, husky cough is fairly constant. The diseased pig is definitely "up on its toes." The *post-mortem* appearances may be of the hæmorrhagic type, and consisting of a petechiation of the skin, the intestinal mucous membrane (chiefly the large intestine), as well as the lungs, kidneys, etc. The large bowel often shows an intense serofibrinous exudation between the mucous and sub-mucous coats, giving a velvety appearance and feel. Frequently the so-called typical follicular ulcers are present, or there may be patches of diphtheritic deposit on the surface of the bowel, accompanied by necrosis of the subjacent mucous and sometimes the submucous coat. The bowel, in some cases, may be greatly congested and swollen, dark venous in colour, and half-an-inch or more thick. Usually the exudate, rich in fibrin, becomes firmly adherent to the mucous surface. The presence of enlarged "strawberry" lymphatic glands of the mesentery and other parts of the body is a particularly useful guide in diagnosis. The diphtheritic membrane appears as a firm, rough, yellow or grey or black surface and *raised*. Diphtherosis may be, and probably is, usually preceded by a hæmorrhagic enteritis.

The *Chronic* type often exhibits no distinct symptoms of illness, and one is astounded at the necrotic lesions seen in the bowels on *post-mortem*. Usually, however, there is unthriftiness, stunted growth, intermittent (watery) diarrhœa, and capricious appetite. The *post-mortem* appearances are, as a rule, confined to the bowels and in the nature of a necrotic enteritis of varying degrees and intensity. In quite a number of cases healing of the bowel lesions will be seen to be taking place.

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DEPT. OF VET. MEDICINE

Infectious Necrotic Enteritis

This condition has been described by various writers under "Necrobacillosis of Swine," "Paratyphoid in Pigs," "Necro. Disease," etc.

American workers have delved deeply into the histopathology and cause of this condition, and whilst much useful information has been furnished, the value of their findings, owing to the enormous dosage of the organism employed, is probably more of laboratory interest; however, their conclusions are of more than passing interest, and will pay for consideration and perusal.

Murray, Biester, Purwin and McNutt[1] have, I think, conclusively proved that the primary organismal invader is the *Salmonella suipestifer*, with the *Actinomyces necrophorus* playing a very important secondary rôle in the production of the disease processes. From field cases of the disease strains of the *S. suipestifer* were isolated which, when fed in relatively large doses, invaded the intestinal tissue, mesentery, and mesenteric lymphatic glands in about 24 hours or less. These workers produced experimental cases of the disease in swine by feeding cultures, and recording their findings by slaughtering the animals at fixed hourly intervals. Their experiments are most instructive and well worth perusal by anyone interested in the subject, but would occupy too much space to discuss in detail here. Briefly, their feeding experiments showed that within 32 hours after feeding cultures of *Salmonella suipestifer* the bowel wall (cæcum principally) showed slight œdema. At 56 hours definite caseated membrane formation begins to appear on the surface of the bowel, the wall of which becomes swollen as a result of œdema and infiltration, and *S. suipestifer* and *A. necrophorus* are found in the exudate. The process is progressive until one gets an extensive diphtheritic or false membrane with necrosis of the underlying tissues.

According to these writers, the necrotic lesions in the ileum, cæcum, and large colon are the basic ever-present specific changes which characterise the disease, and whilst it is not possible to produce the disease at will through field or animal exposure, subjects affected with ascariasis or other debilitated conditions fall more readily to the action of *Salmonella suipestifer.*

Their bacterial findings are somewhat significant and, as the disease process advanced and extended until there was a heavy exudate formation or caseated membrane, where suitable anærobic conditions prevailed the *Actinomyces necrophorus* was present in practically pure culture in the depths of the mucosa, and the *Salmonella suipestifer* in the upper and middle portions of the exudate or membrane.

It is of interest to note that the lymphatic glands in these experimental cases were swollen to about twice their normal size, and markedly congested. The cut surface bulged, and a turbid, blood-stained fluid flowed from the same. Upon scraping off the fluid, the cut surface presented a mottled grey and yellow appearance suggesting foci of necrosis.

In the Swine Fever Scientific Committee's reports of 1895-1897,[2] working with *Bacillus cholercæ suis*, which organism is probably identical with *Salmonella suipestifer*, it was proved conclusively that bacillary necrosis of the bowel could be induced by inoculation, cohabitation and feeding, the lesions produced being those at the present time recognised as indicative of the presence of swine fever, and identical with those seen in the experimental and field cases described by Murray and his co-workers.

Hutyra and Marek, under the heading "Paratyphoid in Pigs," describe a disease which is characterised by necrosing and ulcerative processes of the intestines, and occurs in young pigs especially a short time after weaning, frequently as a sty infection without a tendency towards epizootic extension.

From the foregoing it must be evident that we have in this country disease conditions approximating those described by Murray in America as infectious necrotic enteritis, and those described by Hutyra and Marek as paratyphoid in pigs.

It may seem that I have gone somewhat deeply into the experimental side of suipestifer infection, but this has been done deliberately, in order that one may compare certain conditions obtaining in the field in this country, because suipestifer infection in the field, as in the laboratory, demands excessive dosage, or continually repeated dosage, with the organism, to produce disease.

Diarrhœa accompanied by necrosis of the bowel wall confined to young pigs (suipestifer infection) is quite easily distinguished from swine fever on breeding premises by going over the history of events. If there have been abortions, history of "sway backed" sows, etc., one can be on the look-out for swine fever and be fairly sure of finding it. With the suipestifer infection there is usually no spread of infection from the premises, this being essentially a disease of bad housing, overcrowding, and fancy methods of pig rearing.

A colleague wrote me some time ago, in reply to a request for information, as follows: "If you want suipestifer disease take a large lofty building, lofty to ensure plenty of cold foul air in winter, close up all the ventilators, and see there is not much light. Cement the floor. Use no litter, or very little, and no wooden sleeping platforms. Divide the building up into as many cubby holes as possible, and come round again when the pigs are five to ten

weeks old. It makes it more certain still if you let the pigs out into a small paddock, each lot in rotation, for about half-an-hour each day. The pigs get fresh air, just enough to make them realise what they have missed, and also the chance of passing the organisms on to each other. Wean the survivors early, and always keep a good fire under the boiler for cremating the carcasses. Fatten the sows and sell them; then try ducks for profit." This racy, if somewhat cynical, statement on suipestifer infection in this country is so true to fact that one could not forbear quoting it *verbatim*, in the hope that the writer will be forgiving and not take me to task.

The intestinal lesions in these cases will be found to be mostly confined to the colon and ileum, maybe the blind end of the cæcum, and in the form of a diphtheritic or caseating membrane. When recovery is taking place the ulceration is characterised by a black edge, and in practice one can nearly always rule out these black-edged healing ulcers as not being associated with swine fever, but due to suipestifer infection. Other factors distinguishing suipestifer infection from swine fever are the low mortality and morbidity in relation to the time factor, and the fact that old pigs are practically immune, as against the high mortality and morbidity of swine fever, and the fact that this disease attacks all ages and sizes indiscriminately. Suipestifer infection in young pigs very frequently induces a very dirty, scurfy skin condition which is fairly typical. As has been stated previously, any debilitating condition in young pigs predisposes to suipestifer infection, and one will frequently find it as a sequel to the diarrhœa so often seen in sucking pigs, when three to four weeks old, reared during the winter months, more especially if an ascaris infestation follows on the diarrhœa.

Swine Dysentery

Whiting[3] has described a condition in America which was designated by the stock men "bloody diarrhœa," which shows certain variations from necrotic enteritis, and from which a spirillum was recovered. Murray[4] also calls attention to a case of bloody diarrhœa which revealed numerous spirilla in the intestinal lesions, and which presented some features not present in the necrotic enteritis lesions.

According to Whiting, the condition is characterised in the early stages by moderate fever, diminished appetite, and usually followed by a profuse bloody diarrhœa. The fæces are characterised by mucus, shreds of tissue and blood, the illness finishing up with weakness and emaciation. The course varies from a few days to a few weeks, and chronic cases are more numerous in young pigs. Recovered cases are unthrifty and stunted. The death-rate varies from 40 per cent. to 60 per cent. in young pigs, 20 per cent. to 30 per cent. in feeding pigs, and 5 per cent. to 10 per cent. in breeding pigs. The death-rate in feeding hogs may run as high as 90 per cent.

The changes found on *post-mortem* are observed characteristically in the colon, but may be in the stomach, cæcum and rectum. The small bowel rarely shows lesions. The lesions are in the nature of a hæmorrhagic catarrh of the mucous membrane of the colon with later diphtheritic plaques on the mucosa, and later extensive necrosis of mucosa with covering of diphtheritic exudate.

The blood of diseased hogs did not produce disease, and later the experimental pigs fell with swine fever on exposure. *S. suipestifer* was isolated from a large percentage of cases, but not regularly so. When *S. suipestifer* was tested by feeding, it produced fatal lesions in a percentage of swine, but the diarrhœa supervening was never bloody. *Post-mortem* on the experimental pigs showed considerable necrosis of the stomach and small bowel, and in some cases the colon. The lesions otherwise did not resemble those of dysentery.

Agglutination tests with 100 dysentery-affected hogs with *S. suipestifer*, the blood being collected at different periods during the disease, and after recovery, showed less than 30 per cent. to possess agglutinins for suipestifer, suggesting a cause other than that organism. We have no records in this country of any condition comparable to the American swine dysentery, but it will be convenient to mention at this stage, very briefly, some forms of poisoning.

One sometimes meets with a most acute enteritis which one cannot dissociate from foodstuffs heavily contaminated with fungi, the inference being that the fungi are the primary cause of the enteritis.

Sulphur poisoning is not infrequently seen. Here one has the typical smell on *post-mortem* combined with the history of a heavy dosage with sulphur. The lesions are in the form of a most acute enteritis, as a rule, the bowel wall being extensively thickened and almost black in colour.

Washing soda, when fed in quantity, can produce an enteritis showing very marked resemblances to a swine fever bowel, including petechiation.

Salt and brine, residuals from bacon curing, can and do occasionally produce an acute enteritis, which gives one seriously to think.

Intestinal Coccidiosis of Swine

Since 1921 many Continental observers have reported the finding of coccidia in abattoir swine, but not much significance was attached to the findings as the harbourers were usually in good condition.

Biester and Murray,[5] in America, have carried out somewhat exhaustive studies on the subject, and formed the opinion that coccidial infection in swine in America is probably an important but heretofore overlooked condition.

The symptoms shown in heavily infected swine under field conditions are those of a low grade enteritis. Pigs 35 pounds in weight showed the large bowel to be the seat of an inflammation and exudate, but a true caseated membrane was absent; the bowel wall, however, was greatly thickened. It was usually found in field cases, where the drainage and sanitary conditions of the premises were poor, and the pastures and yards under water during the rainy season. In many cases both poultry and cattle were excreting öocysts.

They noted that whilst öocysts may be excreted, the *post-mortem* may reveal no gross changes or only a slight catarrhal enteritis. They further state that when field cases passing a considerable number of öocysts are brought to the laboratory, and placed in clean experimental pens, the number of öocysts eliminated gradually decreases until negative findings occur on some days, whilst on others one or two öocysts may be found if preparations are carefully searched.

Unthriftiness appeared about 20 days after feeding cultures, and during that period emaciation was marked. The muscles of the loin and gluteal region had wasted so that the prominences of the pelvic bones showed. An outstanding feature in this and all other experimental cases was the marked emaciation, together with an extremely large pot belly and arched back, giving the animal a pear-shaped appearance when viewed from above. The cæcum and large colon were filled and distended with food, the walls being thickened. The wall of the large gut was more than double the normal thickness, and the contents quite adherent. The consistency and external appearance of the large gut suggested an advanced necrotic enteritis specimen, and when opened the contents were found evenly glued to the mucous membrane by means of a muco-fibrinous exudate resembling a carpet.

In experimental cases, twelve days subsequent to the first appearance of significant numbers of newly-formed öocysts, the number eliminated decreased to a point smaller than is found in many cases studied in the field. Emaciation did not appear until about four days after the elimination of öocysts had begun, *i.e.*, eleven days after feeding cultures. By the time emaciation had become advanced the elimination of öocysts had decreased to a number that did not bear direct relationship to the severity of the infection; in other words, by the time symptoms were first recognised the peak of öocyst elimination had passed. The length of these periods may vary, and this is of paramount importance in field diagnosis.

The coccidium proved to be *Eimeria debliecki*, and was proved pathogenic because the newly-formed öocysts in the fæces resulted from extensive invasion of the intestinal epithelium. It is of interest to note that bloody diarrhœa was not one of the clinical manifestations, but constipation, and that *S. suipestifer* was never isolated from any of the cases. Another interesting point is that both field and experimental cases cleared up after being kept on clean concrete floors, pointing to sanitation as the major cause, and that it is a self-eliminating infection.

In a later publication they state[6]:—

(1) Experimental coccidiosis has been produced in chickens by means of sporulated öocysts of swine origin, although the avian cæcal forms are not infectious for swine.

(2) Sporulated öocysts of ovine origin did not prove to be infectious for swine.

(3) Sporulated swine öocysts administered to milk-fed calves did not produce an infection.

(4) Sporulated öocysts of bovine origin fed to pigs resulted in infection. Cultures of öocysts made after one swine passage again appeared infectious for pigs and a calf.

This is another of the swine diseases which has not been described in this country, and one which it has not been my good fortune to encounter; however, several veterinarians have informed me that they are quite conversant with the condition, and it is anticipated that they will come forward and give us the benefit of their experience.

Tuberculous Enteritis

This condition, it may be stated, is somewhat rare. All my cases have been in smallish stores or sucking pigs, with many of the pigs on the premises affected, and in every case one secured a history of feeding on milk from a cow's tuberculous udder. The symptoms were pronounced cough, wasting, and continuous diarrhœa; the *post-mortem* appearances, of generalised tuberculosis with the mesenteric lymphatic glands enormously enlarged and caseating, being quite sufficient to eliminate other diseases. The ulceration is confined chiefly to the large bowel, but occasionally one sees a few isolated ulcers scattered throughout the small bowel. The ulcer itself is a true one, varying in size from that of the surface of a split pea to that of a shilling piece, crater-like in appearance, with somewhat thickened lips, the centre being filled with a yellowish caseous-like material, which is easily washed out. Acid-fast bacilli can usually be demonstrated in

scrapings from the base of the ulcer, but in one case in sucking pigs one had perforce to appeal to the biological test to demonstrate the presence of tubercle bacilli.

DISCUSSION

After a perusal of what has already been written, it will be quite evident that the differential diagnosis of swine fever is never an easy subject to write about as, at the present state of our knowledge, it has not yet been freed from uncertainty, indefiniteness and difficulty.

Pure uncomplicated swine fever is a filter-passing virus disease, and as in many of the virus diseases, difficulties in diagnosis and treatment arise from the attack by secondary invaders on a devitalised, or maybe sensitised, animal body, crowding out or smothering, as it were, the symptoms and lesions produced by the initial attacker, *viz.*, the virus. Some writers even go the length of expressing the opinion that it is questionable whether swine fever ever exists as a disease *per se*.

Many of the viruses appear to be essentially blood stream invaders, and have presumably predilection seats for the exhibition of their visible presence in the form of lesions. In swine fever this predilection seat would appear to be the blood vessels, as evidenced by the petechiation produced in the various organs and tissues.

Cain and Seifried,[7] in a series of histological studies on hog cholera, emphasise the facts that "injuries of the blood vessels constitute the primary lesions in the lymph nodes, kidneys, and other organs," and that "changes in other structures arise as a result of these lesions."

Unfortunately, from a diagnostic point of view, one frequently sees petechiation and hæmorrhages in other diseases in the situations common to swine fever, so that petechiation by itself cannot be accepted as finally diagnostic, and unfortunately, again, the pig would appear to be an animal peculiarly liable to petechiation from unknown causes. If one could have a pure virus infection without the possibility of secondary invaders attacking the weakened defences, one could visualise the hæmorrhages or petechiæ clearing up in the course of a few days by passing through the changes seen in a healing bruise.

The chief point to emphasise as regards swine fever petechiation is the fact that it is probably more deep seated, and in the bowels may be sub-mucous, is very definitely clear-cut, and (if one may use the term) is fixed. By this term "fixed" is meant that factors other than putrefaction—and even then it requires prolonged putrefaction—do not mask the condition. One has exhumed carcasses that have been buried several weeks and found the petechiæ quite clear-cut. Again, one has often seen petechiation, of the kidneys particularly, from causes other than swine fever, which, on immersion in warm water for 20 to 30 minutes, will have lost its clear-cut appearance and become quite diffused. True swine fever petechiation seldom, if ever, diffuses under these conditions.

One is not certain that petechiation invariably occurs, and there would appear reasonable grounds for assuming that it does not under certain conditions, whether from attenuation of the virus, smallness of dose, natural resistance of the animal, or maybe other unknown factors. There seems little doubt that one occasionally may get such a mild attack of the disease that, short of an indiscernible fleeting attack of malaise without the production of any appreciable train of symptoms, an animal may be infective for a short period without anyone being aware of the fact. Diagnosis in these cases is, of course, impossible to the clinician, and one is not aware of the presence of the disease until, through passage, there is an exaltation of the virus with the production of visible symptoms in other contact animals.

At this stage it might be advisable to discuss the so-called *low type swine fever*, and which one infers must be produced by a low grade virus. As I understand it, this form is characterised by a low death-rate, the *post-mortem* lesions are not extensive as a rule, and the intestinal lesions show greater tendency to heal.

Our present knowledge of swine fever virus suggests that passage almost invariably exalts its virulence in non-immune animals. If, then, low type swine fever is a virus disease, one must assume that we have a plurality of viruses as in foot-and-mouth disease. That there may be grounds for an assumption of plurality of viruses may be evidenced by the East African type of swine fever, which differs from our own in that there is no cross immunity, and secondary infections are seldom, if ever, seen. The fact that one does not get secondary infections in East African swine fever may possibly be accounted for by the fact that the normal intestinal flora of the African pig differs from our own. On the other hand, the disease runs such an acute course that the deaths average about 98 per cent.

If low grade swine fever is not due to a low grade virus—and so far as I am aware, steps have never been taken in this country to establish the presence of a filter-passing virus in these cases—one would appear to be justified in assuming, judging from the symptoms and lesions, that they are due to some particular strain or strains of suipestifer.

It would appear almost certain that the virus does not multiply in the lesions produced (petechiæ), but having caused some impairment of function, a most pronounced leucopænia, the field is open for the secondary invaders (should

they be present, as they almost invariably appear to be) to produce the more visible and permanent lesions of follicular ulceration and diphtheresis, and which are looked upon by many as the true lesions of the disease, and on which a diagnosis is based. The swine fever virus is no respector of pigs, attacking all ages, sizes, sex or breed, a point to remember in diagnosis. Having done its fell work, and seeded the ground for secondary invaders, in the majority of cases at least, the virus appears to depart from its host, a feature common to other viruses. Dorset and his co-workers found the blood of freshly-infected pigs infective as early as the first day, the secretions from eyes and nose after three days, and urine after five days; whereas in completely recovered animals three days after the febrile stage, the virus can no longer be demonstrated in the blood, secretions or excretions.

This, of course, raises the question as to the length of time required before it would be safe to mix recovered animals with healthy swine, opening up a nice problem for our research workers, and at the same time raising the problem that, whilst the particular body fluids mentioned were apparently sterile of virus, might not some other portion of the pig's anatomy be non-sterile for a considerably longer period?

We have now some definite information as to the formation of diphtheresis, and can surmise that the button ulcer has a slightly modified formation. It would appear that button ulcer formation is invariably preceded by a hæmorrhage somewhat deep-seated in the mucous or sub-mucous coat, but beyond the stage of petechiation. The tissues having been damaged, as suggested by Cain and Seifried,[7] the secondary invaders, *S. suipestifer* and *A. necrophorus*, get busy, but the lesion, instead of spreading, remains circumscribed with probably a certain amount of fibrous tissue formation. The peculiar calumba root ulcer probably results from a larger hæmorrhage which is never properly absorbed, becomes in part organised and contaminated with the intestinal bacteria. A certain amount of thickening of the surrounding tissues (fibrosis) takes place, which, in time, has the tendency and actually does contract down in such a way as to expel and protrude the actual necrotic ulcer on a stalk or pedicle.

In the light of our present knowledge, ulcer formation and diphtheresis appear to result in the majority of cases from infection with *S. suipestifer* and its secondary co-worker *A. necrophorus*. Other organisms have been incriminated, and doubtless other organisms, probably of the *paratyphosus B.* group, are capable of producing, and do produce, similar lesions, but the difficulty arises in deciding whether the swine fever virus is present or not. Pending some reliable, accurate, and simple diagnostic test, one will be compelled to rely on the clinician, who can only form his opinion on a detailed analysis of the history, symptoms, lesions and progress of infection, there being no one individual point on which to anchor. The typical case with its clear history, clear-cut petechiation and velvety bowel, with the typical strawberry abdominal lymphatic glands with their ruby-red marginal congestion, and parenchyma interspersed with normal and deeply-congested tissue, is easy. The difficulties crop up where one sees only diphtheresis and ulceration. The points to bear most in mind here are that necrotic enteritis *per se* is practically confined to young pigs, and that extensive or diffused diphtheresis in young pigs is more likely to be necrotic enteritis than swine fever. Here, again, one is labouring under difficulties once more, as the lesions may be the sequel of swine fever, and with no definite diagnostic test other than the demonstration of the virus one must take all other factors into consideration. In this connection nothing is more fatal than the overcrowding of young pigs after weaning, particularly if there have been any evidences of worm infestation, bowel trouble or unthriftiness in them as suckers.

Overcrowding, with its concomitant evils of parasitism, etc., creates just the right environment for *S. suipestifer* to get busy. In fact, necrotic enteritis, parasitism, and intestinal coccidiosis are essentially conditions arising from insanitary methods, overcrowding and improper dieting.

Several workers have been endeavouring to evolve some method of diagnosing the presence of the filter-passing virus. Lewis and Shope[8] state that " tentatively it would appear that hog cholera is the only acute infectious disease of swine characterised by a decrease in the white blood cells (leucopænia). This is of such a profound degree as to be of diagnostic importance. A leucocyte count of 8,000 per cu.mm. or less on three animals in a suspect herd indicates clearly the condition is hog cholera."

Cole,[9] in another article, states: " a leucopænia may therefore be regarded as a usual though not constant feature of hog cholera."

One can only conclude with the hope that intensive research into swine diseases in this country, which is long overdue, will be begun. Attending conferences and making speeches about the apparent defects of others is so much easier than the application of an imperfect knowledge, and if one appears to be an iconoclast, it is in the hope that after a free interchange of views and experiences we may ask: " What has this taught us that it will be of benefit to us to know, and how will this knowledge lead to action?" One is quite sure

that our research workers will appreciate the quiet testimony of capable practitioners trained to draw deductions from what they see, and very sure of what they know.

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The final paper to be discussed by Congress was the foregoing, which was considered by the Experimental Pathology Section at the second session on Friday, September 22nd, at the Town Hall, Llandudno.

In the absence of the President and Vice-president of the Section, the Chair was occupied by Captain J. McAllan (Belfast), who invited the author of the paper to amplify, or comment upon, his contribution, should he so desire.

Mr. J. O. Powley, in introducing his paper for discussion, observed that that was called the Experimental Pathology Section; he laid no claim to be anything of a pathologist, but he had tried to speak on the subject before them entirely from the point of view of the practitioner.

He had brought some specimens there, which they could look over after the meeting, and which would describe to them better than any words of his could do, the conditions of which he was treating.

The question of pig diseases was a particularly important one at the present moment in view of the fact that there was a committee sitting which was looking into the question of the diseases, of economic importance, in the pig. He did not know whether there was a veterinarian on that committee; one hoped that there was, and that he was a man fully conversant with pig diseases.

Discussion

Mr. E. F. Beckett (Blandford, Dorset) in opening the discussion, said:—

In opening this discussion, I would first hasten to congratulate Mr. Powley on his comprehensive paper. In view of the magnitude of the subject and its manifold difficulties, I consider his paper masterly. You will have noticed that he has dealt with his subject under five headings, the first two of which are:—

(1) Swine Fever.

(2) Infectious Necrotic Enteritis (so-called).

I would, however, have preferred him to have described the first two headings as follows:—

(1) Swine Fever (so-called).

(2) Infectious Necrotic Enteritis.

This statement is made because I believe that most of the outbreaks of so-called mild swine fever are, in reality, necrotic enteritis.

I would also beg of you to consider "ulceration" in its correct perspective. This lesion has for years provided a "smoke-screen" that has almost completely obscured the vision of the clinician and others, so that, in the case of the pig, the presence of an ulcer quickly produces a panic-stricken state of mind, during which all other evidence is forgotten and swine fever diagnosed.

It is my intention to deal with the subject purely from the aspect of the clinician and the data I shall work from will be chiefly that collected by myself during the last five or six years. In view of the controversy concerning swine fever and its possible relation to necrotic enteritis, these diseases will be studied collectively. It is generally admitted that swine fever is a septicæmia produced by a filterable virus, attacking pigs of all ages, and that the condition may be complicated by the invasion by secondary organisms. There is, however, sharp division of opinion in chronic cases where the *post-mortem* lesions are chiefly confined to the intestines and mesenteric lymphatic glands. It is now universally accepted that factors other than the virus of swine fever may be the cause of lowering the animal's resistance to such organisms as *S. suipestifer, S. enteritidis,* etc., and outbreaks distinguished by a low mortality and morbidity may occur with great frequency in the absence of the virus. During the course of investigations carried out in connection with an extensive outbreak of suspected swine fever, careful records of the deaths, for the period from 1925-8, were kept by me. Graphs were made from these records and are worthy of close examination. These graphs [exhibited] fall under four headings corresponding with the animal's development: (*a*) suckers, (*b*) store pigs, (*c*) adult pigs, (*d*) all pigs.

(*a*) *Suckers.*

1925-6.

The mortality curve began to rise slightly during September. It rose rapidly during November, reaching its peak at the beginning of January, and then began to fall steadily until April, when a slight rise was shown. It fell again in May and the curve remained low throughout the summer.

During the years 1926-7 and 1927-8 the mortality curves were much the same.

(*b*) *Store Pigs.*

During the period September, 1925-September, 1926, the mortality curve began to rise in October and continued to rise during the ensuing few months, reaching its peak in March, when it began to fall, and a low level was maintained throughout the summer.

September, 1926-September, 1927.

The mortality curve started to rise somewhat earlier than in the preceding year. Deaths began to increase during September and decreased during October, only to rise in November. The curve fell again slightly during December, but with the advent of the New Year rose again and maintained the rise throughout January and February, the highest point being reached in March. With the coming of spring the curve began to fall rapidly and fell steadily during the summer months.

September, 1927-September, 1928.

The increase in casualties started a little later than in the preceding year, the mortality curve beginning to rise in October, and it rose steadily during the next few months, attaining its highest point somewhat earlier than in the years 1925-7, the peak being reached in January. The curve fell rapidly during February and early March, and although a slight rise took place during March and April, the curve, taken broadly, is the same as in previous years; that is, heavy mortality during the winter months and a rapid fall in the death-rate during the summer.

(*c*) *Adult Pigs.*

It is with the greatest interest that one studies the mortality curve for adult pigs over the period covered by these investigations. The number of deaths has been low, and, unlike what is seen in the case of the younger animals, the seasonal factor does not seem to have played so important a part. Losses during the summer months among adult stock have been, for all practical purposes, very little different from those sustained in the winter.

(*d*) *All Pigs.*

The mortality curve for all pigs merely confirms the statements made in the previous paragraphs. A careful scrutiny of the graphs definitely shows the seasonal incidence of the disease, in so far as these investigations are concerned, and the time factor is equally obvious.

In outbreaks of suspected necrotic enteritis the symptoms displayed by sucking pigs are of importance because of their constancy. It is at about three weeks old that initial symptoms appear, and one is struck by the dull pale colour of the pigs. The faint pink tinge that one associates with the skin of the young pig is absent, and because of the paleness of the skin, the eyes look unduly prominent. While the pigs appear to some extent listless and in many cases their tails hang down straight, they appear to carry flesh and have a stocky appearance, until about the fifth week, when they begin to lose flesh. This is particularly noticeable in Berkshires which, when affected, have a short, fat, square appearance, but at the same time the skin has a dull look. In many cases the ears and other parts of the body become blue. "Thumps" is a common symptom, but it is possible that this phenomenon is caused by the larval stage of ascarids. Profuse diarrhœa occurs at any time between the third and fifth week after birth. I took the temperatures of 500 suckers from birth to weaning and it was hoped when this work was carried out that a temperature reaction might give warning of the impending danger, but the result of this work was negative.

In store pigs the first indication of the onset is that one or more pigs show a disinclination for food. They may come to the trough, but soon give up any attempt at feeding. They stand about with hanging heads, backs arched and tails down, which gives them a woefully dejected appearance. In the early stages the temperature is elevated, but in animals that survive the acute attack there is little rise in body temperature. The skin on certain parts of the body changes colour; this is first noticed on the ears, and later under the arm-pits, belly and inside the thighs, which may turn blue or purplish-black. Small scabs are often found on the skin—streptococci have been isolated from these. The presence of conjunctivitis, with the production of a muco-purulent discharge and matting of the eyelids, is rarely seen in necrotic enteritis. Constipation may be noticed, but in a large herd this often passes unobserved, and the first indication of the alimentary tract being affected is profuse diarrhœa accompanied by a most offensive odour. The skin presents an unhealthy appearance, and this may be complicated, in the case of pigs kept in the open, by weather conditions; pigs, particularly white ones, kept in the fields during the summer frequently suffer from sun-burn. It is this condition, aggravated by the animal's rubbing as a result of the irritation, that has caused uninitiated observers to suspect mange. Provided death does not follow the acute stage, the animals lose flesh, growth is retarded, and there is a general appearance of unthriftiness. Weakness of the hind limbs is present, the hind

quarters swaying from side to side when the animal moves. Later, the animals lie about, are difficult to get up, and death finally ensues from weakness and exhaustion. Anæmia is almost invariably found in chronic cases.

During the period covered by these investigations I made rather more than 4,000 *post-mortem* examinations. In unweaned pigs up to the age of five weeks one found that the animals were apparently in good condition, although the amount of subcutaneous fat varied. The heart is dilated and the lungs crushed back beneath it. There was great effusion of fluid into the pericardial, pleural and peritoneal cavities, and this fluid, particularly in the peritoneal cavity, contained large coagulated flakes. The liver and kidneys were pale in colour and the spleen in many cases enlarged. The pancreas was extremely white in colour. It is in unweaned pigs between the age of five and nine weeks that more definite changes are noticed. Autopsy reveals that pericarditis is commonly found, and that in many cases pneumonia, pleurisy or pleuro-pneumonia are present. Gastritis, too, is frequent, but by far the most constant lesion is enteritis in all its forms. It may exist as a mild inflammatory condition, or in any stage up to ulceration and necrosis. In a very large number of animals the bowel wall appears much thickened, and the lumen is diminished owing to the diphtheritic deposit. This can be frequently wiped off, giving the mucous membrane a furry appearance. In others, long, red inflammatory ridges will be found extending down the length of the intestine; this is most common in the small intestine. While in some cases the glands have been found to be hæmorrhagic, they are commonly hypertrophied and display various degrees of œdema. Petechial hæmorrhages in the various organs are found only in exceptional cases.

In store pigs the lesions are confined chiefly to the intestines and associated glands, although other organs in the body show well-defined lesions. Because of the fact that the most important lesions are confined to the intestinal tract and associated glands, it has been decided to consider them first. Necrotic enteritis affects both the large and small bowels, and, therefore, as there is little to be gained by dealing with them separately, they will be considered together. In acute cases the bowels show a severe inflammatory condition. This inflammation may consist of streaks down the length of the bowel, or the whole bowel may be bright or dark red. In animals that have survived the acute stage the lesions shown are most varied. In mild cases the abnormality may amount to no more than a slightly roughened appearance of the mucous membrane, but in the more chronic cases severe necrosis, diphtheresis and ulceration are found. The deposit on the bowel shows three distinct forms, or stages, which are as follows:—

(*a*) a slightly roughened condition of the mucous membrane;

(*b*) a thin, greyish-yellow deposit, about 1/16-in. in depth, which cannot be rubbed off.

(*c*) a thick, greyish-yellow deposit, about ⅛-in. in depth. This is easily wiped off, leaving the mucous membrane roughened in appearance, very like that described under (*a*).

In pigs showing well-defined lesions of necrotic enteritis, ulceration is present in about 5 per cent. of cases. It is well to bear in mind that, although ulceration may be absent in the cæcum, it is unwise to assume for this reason that it does not exist elsewhere. It is commonly found in other parts of the large bowel or may be present in the small intestine. Scars are commonly found where resolution has taken place and these may vary from small circular areas to long scars extending as far as 1-2½ inches down the length of the bowel.

The Lymphatic Glands.—While changes in the glands throughout the body have been noticed, the glands chiefly affected are the mesenteric glands. While admitting that in a certain number of cases the glands have been hæmorrhagic, it must be emphasised that in necrotic enteritis this is not common. The majority of *post-mortem* examinations have shown that the mesenteric glands are hypertrophied and that œdema is present in varying degrees. It is remarkable that while little or no change can be found in glands in other parts of the body, the mesenteric glands show these lesions in such a large number of cases.

Stomach.—Gastritis has been revealed in a large number of cases examined.

Liver.—While in some cases fatty degeneration was found, by far the most common lesions are (1) enlargement and congestion, (2) cirrhosis. In chronic cases of necrotic enteritis, cirrhosis is almost invariably found.

Spleen.—This organ is very often found enlarged.

Kidneys.—The lesions found are important in view of the diagnostic value of petechial hæmorrhages in swine fever. In the vast majority of examinations made, little macroscopic change was noticed, the organs being commonly pale in colour, but it is true that in a small number petechial hæmorrhages have been found; it must not necessarily be assumed, however, that the virus of swine fever is present.

The Bladder.—It is extremely rare to find lesions in this organ.

The Larynx.—Macroscopic lesions are rarely found in this organ.

The Heart.—When lesions are found in this organ they are usually associated with other diseases, such as swine erysipelas.

The Lungs.—Pneumonia has been found extensively, commonly affecting the lower lobes; pleuro-pneumonia is also seen. In considering the lungs, however, it is wise to remember that where large numbers of pigs are slaughtered, the number of animals in which the lungs are affected is extremely high. Parasites are a fruitful cause.

As the time at my disposal is limited, complicating diseases and the methods adopted to combat them will not be considered. I will, however, dwell for a few minutes on one or two experiments carried out in connection with our investigations. In view of the different results claimed by the Rowett Institute on one hand and certain American writers on the other, it was decided to feed ferric oxide with the object of reducing the anæmia in sucking pigs. The iron was fed in large doses to the sows—2,000 animals were treated. While satisfactory results were achieved up to a point, the reduction in losses was disappointing. This experiment confirmed the work of the Americans—Hart, Elvejen, Steenbock, Bokstedt and Fargo, and it is practically certain that any improvement was due not to feeding iron directly to the sow, but to the small amount picked up by the young pigs when nibbling the fæces dropped by the dam or in the food in the trough. Owing to the very large numbers involved, feeding iron individually to sucking pigs was not attempted.

Dorset advises the use of the serum-alone method on infected premises, if the virus infection is complicated with bacterial infection—salmonella, pasteurella, erysipelas ("Control of Swine Fever by Immunisation," Dorset. Veterinary Congress, London, 1930).

It was decided to vaccinate with swine fever serum. The serum used was American—Lederle. This experiment was carried out on 1,400 pigs, 1,000 being inoculated and 400 acting as controls. Inoculated and uninoculated lived together, with the following results:—

Inoculated pigs.	*% of deaths.*	*Score.*
1,000	10%	79
Uninoculated pigs.	*% of deaths.*	*Score.*
400	10%	77

It will be advisable to explain what is meant by the "score." The score is an attempt to show the state of perfection attained by the individual, taking 100 as the maximum number of marks given to the perfect pig at the time of disposal. It is obvious from the result that inoculated pigs had a score of 79, while uninoculated a score of 77. The percentage of deaths was the same in each case.

It will therefore readily be seen that there is practically no difference in value between inoculated and uninoculated at the time of disposal; also the important fact that the percentage of deaths was the same in each case. The results, therefore, were disappointing, and as the work done by Dorset is of the highest order, the failure of serum inoculation in our case makes only one conclusion possible—that a virus infection was not present. The rations were changed on so many occasions, in an attempt to combat the outbreak, that it is not proposed to go into all the details; furthermore, I do not propose to discuss the relative merits of dry and wet feeding, but merely state that each has its use, and dry feeding undoubtedly results in a great saving of labour. At the same time, it is my opinion that fattening pigs to be finished off must be wet fed. It gives that additional bloom which is never attained with dry feeding.

It is certain that on premises where pigs are stocked in big numbers and overcrowding is practised, outbreaks of any disease common to swine will appear. In the early days of these investigations pigs were overcrowded both in the yards and in the fields. When the numbers in each yard and field-pen were reduced considerably, the losses fell in a direct ratio to the reduction. In the sucking pigs, efforts were made to control the diarrhœa, and most of the internal antiseptic and astringent drugs were used. The results, in most cases, were unsatisfactory, and it was not until formalin was used that any real headway was made. The formalin was used in conjunction with liq. ferri. perchlor. fort., and the results obtained were so remarkable that it was at first thought to be specific. Later work proved that this treatment, although successful in a very large number of cases, failed completely at certain times, but its value has been demonstrated in so many instances, and in so spectacular a fashion, that its merit must not be disregarded.

I contend that these investigations show that one has good reason to believe that in many outbreaks the virus is absent. The outstanding feature is the age at which animals are affected and my information shows that the disease is confined to animals under six months, and that the greatest number of deaths takes place between eight weeks and five months. In outbreaks of swine fever due to the presence of the virus, it is acknowledged by the leading authorities that pigs of all ages are susceptible, and it is therefore remarkable that no adult animals have been attacked, particularly when one remembers that one is dealing with thousands of pigs. The graphs I have exhibited demonstrate, without doubt, the seasonal influence, and a study of them clearly shows that the disease is at its height from November to March: also the time factor is obvious; that is, if any given period be taken for any year, the severity of the attack is practically the same. Most writers of authority are agreed that animal inoculation is too slow and costly a method to be of much value for the early diagnosis of swine fever and, therefore, as a rapid

diagnosis is obviously necessary, it must be based on: the symptoms, the length of time the disease has been in existence, the *post-mortem* findings, the date of entry of fresh animals into the herd, and the history of the premises. It is therefore obvious that the "man on the spot" is best qualified to give an opinion, and that a small section of bowel showing an ulcer is of little value for diagnostic purposes by the time it reaches a laboratory. In necrotic enteritis the changes in the lymphatic glands are almost invariably confined to the mesenteric glands, and therefore it is the hypertrophy and œdema present in these glands that is of the greatest importance in the diagnosis. All forms of intestinal ulceration and diphtheresis have been commonly found, and I cannot subscribe to the opinion that this is always caused by secondary invaders, following injury to the bowel by the virus.

The secondary invaders are thought by many to be normal inhabitants of the bowel, and innocuous so long as the bowel remains uninjured. Why should it be believed that when ulceration and diphtheresis occur, the only cause of injury to the bowel is the virus of swine fever? It seems quite reasonable to suppose that other agents are capable of inflicting damage on the bowel to such an extent that invasion by secondary organisms becomes possible, and the results of these investigations force one to consider such agents as parasites and dietetic errors causing digestive disturbances, followed by irritation of the mucous membrane. These dietetic errors may not necessarily mean that a balanced ration is not fed, but that the quality may be indifferent, and, in the case of wet feeding, that the mixing has been unsatisfactory, or too great a quantity prepared and perhaps carried over for some days, with fermentation and decomposition as the result. The possibility of manufacturers changing the composition of a mixture while retaining the same analysis, must not be lost sight of; it is done to take advantage of existing markets. While it is admitted that *S. suipestifer* may be a normal inhabitant of the bowel, and in the case of healthy pigs its presence is harmless, the possibility that this organism may become pathogenic at any time when the animal's resistance is lowered, cannot be disregarded; from the data I have given in connection with the seasonal incidence, it is thought that exposure to bad weather, together with insufficient shelter, may be a factor of considerable importance. It is also certain in the case of anæmic pigs, their resistance to any organism is very much lowered. It may be argued that, owing to the low mortality, some immunity was developed in the pigs concerned in these investigations, or even that the outbreak was due to a low-grade virus; it is not possible to agree with either of these views because, in the case of the former, after the disease had been in existence for three years, a number of breeding animals (about 40) purchased in different parts of the country, were introduced into the herd, and as no special precautions were taken in connection with them, it is most extraordinary that no losses took place among them. With regard to the latter, if a low-grade virus was present one would expect that at some period or other the virulence would increase, with severe losses as a result.

It is therefore thought that the disease investigated closely resembles that associated with the so-called "mild swine fever," commonly found in this country, and the diagnosis of which is mainly arrived at as a result of the intestinal lesions found on *post-mortem* examination.

It is my opinion that if investigations were extensively carried out in connection with these outbreaks of so-called "mild swine fever," it would be clearly shown that necrotic enteritis is being dealt with, and that the virus of swine fever is absent.

In the interests of the veterinary profession, and also of the pig industry, it is of the greatest importance that it be fully realised that *ulceration*, in itself, is not diagnostic of swine fever.

Captain A. W. Noel Pillers (Liverpool), who followed, said: I think those who selected the subjects which we are now discussing are to be congratulated, because of the importance of them to the profession in many directions. Criticism is often levelled at our methods of handling disease, both as practitioners and as State officials. There is, in this case, no doubt that a considerable amount of this condemnation is fully justified.

The profession always listens with pleasure to what Mr. Powley has to say. His clinical and administrative abilities have often helped many of us, and it is with pleasure that I acknowledge my indebtedness to him in these spheres. He is to be congratulated on writing just over one column on swine fever with only once mentioning the word "ulcers," and even then it is "follicular ulcers." I think his effort would have become a classic if he could have but left out this one dark spot. He then gives us nearly three columns on infectious necrotic enteritis. Are we to take it from this that he regards the latter disease as three times more important than swine fever or that cases officially diagnosed as swine fever are really likely to be "three to one on" that they are infectious necrotic enteritis? If this is so, he can count me as one of his supporters.

In *The Veterinary Record* for 1928, Vol. 8, p. 1041, I was bold enough, after a few years of observation and reading, to contribute a note entitled "The Unsatisfactory Position with regard to the Definition, Diagnosis and Control of Swine Fever." I received many encouraging

messages from veterinary surgeons engaged in field work on swine fever and was advised to continue my observations. I was therefore hopeful that some improvement might have resulted.

One or two correspondents, however, suggested that the "Ministry" could not very well be wrong. I fully realise the value of such a suggestion, but I do not like what may be termed "sheltering." We must all realise that the "Ministry," so far as the diagnosis of contagious diseases is concerned, consists of the veterinary staff and that it is controlled by the Chief Veterinary Officer. If we accept without representation a policy which we know to be wrong, we ourselves must take the blame. A good clinical definition of the disease is wanted, and also an agreed description of the *post-mortem* findings. If to these a suggestive clinical history be added, it ought to be easy, in a large number of cases, to arrive at a diagnosis on the spot. Would Mr. Powley kindly tell us what are the arguments in favour of sending material to a central laboratory for diagnosis? I could quite understand this being done if the etiological factor was to be demonstrated. An experienced field man with the history, the live animals and a fresh specimen is more likely to make a correct diagnosis than a laboratory worker with a much-travelled, frowsy bit of gut to examine, which will, in an acute case, have lost many of its characteristics. Owing to delay, in acute cases there may be loss, incurred by owners, owing to the fact that they would be unable to market their healthy stock quickly, but the real hardship falls on the unfortunate individual who is kept indefinitely under restrictions by reason of a disease from which his animals are not suffering. In these cases, it would be better for everyone concerned, and more especially for the owner, if the diagnosis was left in the hands of the experienced field officer.

The Report of the Proceedings under the Diseases of Animals Acts for the year 1932 shows that out of 11,576 reported cases of swine fever only 1,555 were confirmed, *i.e.*, 86·6 per cent. unconfirmed and 13·4 per cent. confirmed. One agrees with the reporting of suspected disease, but when six cases out of every seven are not confirmed there must be something wrong. A large number of veterinary surgeons, when they encounter a dead pig, tell the owner to report it. It is then dealt with by the official body, and if it is not swine fever, the veterinary surgeon has deprived himself of the opportunity of telling the owner what is wrong on the spot and at the same time earning a fee. Unless there is a definite suspicion of swine fever the veterinary surgeon has every right to make a *post-mortem* examination, providing he excludes anthrax, and were this done oftener pig practice would increase. If indications of swine fever were found, the case could easily be reported. I have seen a pig with an ulcerated cæcum confirmed as being affected with swine fever, and yet no other animals on the premises have died. I have seen a number of pigs die in a very short period and which, on *post-mortem* examination, showed hæmorrhagic lymphatic glands throughout the body and enteritis, not confirmed as swine fever for weeks; yet when the last death occurred and the carcass was found to have ulcers in the cæcum, the existence of the disease was confirmed. It must be realised here that the first deaths did not result from an ulcerative condition. All the while such premises would be under restrictions. I think the pig-keeper has a genuine case here against so-called control as at present exercised. Often animals are licensed from infected premises to abattoirs and, on slaughter, quite a percentage may be found to be showing lesions of what are regarded as swine fever. This seems a possible means of spreading infection.

There are about nine Orders of the Ministry of Agriculture and Fisheries dealing with swine fever, and it is high time that they were consolidated and brought up to date. The chief one of these was framed in an atmosphere of compensation for slaughter. Then came a period in which serum was used, and now we are in an era of masterful inactivity. I fully believe that we could do more for the pig owner, for the pig and for ourselves if a committee of this Association was set up to establish a definition, a clinical picture, a *post-mortem* account and suggestions for the guidance of our members. Something similar is already being done in the case of euthanasia, and I see no reason why a like course could not be adopted here. It would increase our usefulness to the pig industry at a very opportune moment.

I well know the difficulties of diagnosis, but without these difficulties we should not be required. In order to be constructive, I beg to suggest that the Council of this Association be asked to set up a committee to consider this matter and so lift us out of this "slough of despond."

If it is necessary, Mr. Chairman, I will move that.

Mr. K. D. Downham (Harper Adams College) observed that he thought that that meeting had shown that there was at least one member of the veterinary profession whose presence would be of great value to the Pig Committee. He would like to suggest that the information which Mr. Beckett had at hand might be put before the committee by asking him to attend and give some of his findings.

Professor G. H. Wooldridge (London) said that he was sure they would all agree with him that they owed Captain Powley a very deep debt of gratitude for focussing their attention upon that variety of conditions which, until

recently, had always been grouped together as swine fever.

He would ask them to bear with the people who had had to shoulder responsibility. To his mind, swine fever presented a very close resemblance to distemper in the dog. They were both due to filterable viruses, and in the course of both conditions they might get a variety of complications. Moreover, it was very unfortunate that a diagnosis might often have to be made as a result of the lesions produced by those secondary invaders. There was no doubt that, given an heavy infection with these organisms independently of the primary virus, they might get lesions produced which were indistinguishable from those lesions following a virus infection, and he thought under those conditions the difficulties that had to be contended with ought to be considered rather more carefully and with rather less censure.

He would like to ask Mr. Powley not to overlook the importance of dietetic influence in the production of intestinal lesions. He had a very definite recollection that in the days when he was engaged in making *post-mortem* examinations of pigs suspected of swine fever, the farmers of Cheshire, on his showing those intestinal lesions, often said: "That is not swine fever; we can produce that any time we like, and we can cure that any time we like." Of course, he did not accept such views; nevertheless, those farmers assured him that by intensive feeding with whey and Indian meal, they could produce those lesions, and that by changing the type of food and administering potassium permanganate they always got recovery. He was quite sure that there was a lot of truth in what they said in regard to a change in the line of feeding.

Then again, some little time ago he was asked to look into some pig mortality on a large scale, where specimens had been sent up to the Ministry and the verdict returned was "not swine fever," but where the veterinary surgeons in the case were of opinion that the Ministry had made a mistake, especially as a number of pigs kept dying. On going into the question, and getting the report from the Ministry, he considered the matter of the food. The majority of the pigs had been out grazing, and they searched the fields for any irritant plant that might have caused enteritis, and also the food stores. In the latter he found two samples of fish meal. One of those was heavily charged with moulds; the other looked to be a fine sample. He imagined the mouldy sample to afford a very likely clue to the origin of the trouble; accordingly, he took samples of both stores of fish meal with him and submitted them to Dr. Clough. He received a report which greatly surprised him. The sample which he thought was the more likely to be the cause of the trouble had no irritating substance in it; the other had 18 per cent. of sea sand, and the enteritis that caused the deaths of the pigs was due to that cause. When the feeding with this meal was discontinued the pigs did very well indeed.

He would ask them, therefore, while paying full attention to the valuable observations contained in the paper concerning the cause of enteritic conditions in swine, not to let those statements blind them to other possible sources of the trouble. He congratulated the essayist on his effort and Mr. Beckett on his opening of the discussion.

Captain A. W. Noel Pillers observed that if Professor Wooldridge would stay with him for a short while he would guarantee that he would speak on another note on that question and would urge the need for rapid action. It was of extreme importance that they should get going now.

Professor Wooldridge replied that he had every sympathy with the point of view put forward by Captain Pillers, but he did not want the position to be entirely obscured by reason of the existence of other sources of the trouble.

Dr. W. H. Andrews (Weybridge) expressed his appreciation of Mr. Powley's paper, in which much had been included within a small compass, and of Mr. Beckett's opening. He was greatly interested in Mr. Beckett's facts and also in the views put forward by Captain Pillers. He had some sympathy with the views put forward by both of these gentlemen, but he wished to give his own personal views on the matters in question.

Captain Pillers had quoted figures to show the relatively small proportion of reported outbreaks that were confirmed, and had shown that the total number of confirmed outbreaks might be regarded as small. The speaker found nothing at all to regret in that position. On the contrary, having regard to the nature of swine fever and what it might mean to the industry, he found the small number and proportion of confirmed outbreaks a matter for congratulation. A readiness to report outbreaks as suspicious, even though in the majority of cases the suspicion were later proved to be unfounded, was bound to help early diagnosis and limit the spread of the disease. The comparatively small number of confirmed outbreaks certainly supported the idea that the measures taken for the control of swine fever were proving effective.

As to the diagnosis of swine fever, he could not agree with Mr. Beckett in considering it perfectly simple. He agreed that diagnosis might be very easy, but it was by no means always so, and as it was important to be able in all cases to arrive at a reliable diagnosis, and to do so without undue delay, he regarded the diagnosis as a matter that might be really difficult. The general picture of typical swine

fever was sufficiently characteristic, and given full particulars, it was no doubt reasonably easy to distinguish between a really characteristic outbreak of swine fever and a characteristic outbreak of necrotic enteritis or any similar disease. He did not believe that any infectious disease could be trusted always to appear in a really characteristic form. The only really certain means at present available of diagnosing swine fever was the sub-inoculation of material into healthy and susceptible swine. Perhaps that method was not absolutely certain, but in any case, it could be applied only in particular cases and was far too expensive a method for serious consideration as a routine measure. The important point from the practical aspect was that measures of control, to be effective, had to be applied at once, and the great practical difficulty was to arrive in all cases at a certain diagnosis within a reasonably brief period. He did not believe that there was one single feature, symptom or lesion, that alone could be relied upon for establishing a certain diagnosis. The clinical features of the outbreak and the rate of spread were valuable factors, but alone they could not be relied upon in every case. For example, the age of the affected animals was not an infallible guide. They knew that swine fever, at at least the acute type of disease, attacked swine of all ages. An outbreak found to be confined (at the particular time) to young pigs might probably be one of necrotic enteritis, but the age of the affected animals alone could not justify one in excluding swine fever. In this connection he mentioned an outbreak of foot-and-mouth disease in which the only animals found to be affected, when the outbreak was dealt with, were sucking pigs. They knew that swine fever might spread rapidly through contact pigs, but a very slow rate of spread would not, in itself, justify one in excluding swine fever. In support of that, he again alluded to foot-and-mouth disease, which in some outbreaks might spread in a herd at a rate that was unexpectedly and surprisingly slow.

The same considerations applied in connection with *post-mortem* lesions. They might feel that the intestinal ulcer, admittedly due directly to secondary invasion, was not a satisfactory basis on which to establish a diagnosis. He certainly would not agree that the ulcer was of no value and should be ignored, but he would agree that the ulcer, considered apart from other factors, might be of limited value. No more could be said, however, for any other lesion that had been described. Some workers attached much importance to petechiæ; for example, petechiæ on the surface of the kidney, but one could not establish a certain diagnosis on the presence of petechiæ only. The presence of petechiæ under certain circumstances might help greatly to confirm the presence of swine fever, but alone they did not prove it, nor did their absence prove that the swine-fever virus was not or had not been present.

He thought it perfectly natural and right that they should feel some dissatisfaction with the the weapons at their disposal in connection with swine fever, as well as a number of other diseases. The question of the actual administrative measures taken to control swine fever was not his province or concern, but to those who thought that changes should be made, he would point out that administrative measures had to be imposed with great care and caution, and that a change that might appear to be highly desirable in particular circumstances, might prove to be impracticable or unsound when it had to be applied to all cases or in all circumstances. From the scientific point of view, he felt that they still needed more information on a number of aspects, and that intensive research might well be directed towards finding more reliable and more speedy methods of differential diagnosis. In that connection, he might add that more extended swine-fever research was contemplated in the immediate future at the Weybridge laboratory, and that the Agricultural Research Council had appointed a special committee to co-ordinate research in swine fever and necrotic enteritis.

One's views on the subject of the diagnosis of swine fever in the field were partly determined by what one believed concerning the existence of a low grade virus, or of virus strains of low potency. The existence of low-grade swine-fever viruses might not have been satisfactorily proved, but he felt that at least the possibility of their existence could not be excluded. He had referred several times to facts relating to foot-and-mouth disease. His excuse was the fact that foot-and-mouth disease was a virus disease that had received generous support on the research side, and had received concentrated and continuous attention over a number of years. One very striking feature of that work was the very great variation discovered when each virus strain was examined as it arose in the field. By examining a succession of field viruses one obtained evidence of variation that would never be revealed by intensive and prolonged work in the laboratory with one or two selected strains. He did not believe that swine fever had received the same concentrated attention on the experimental side, and he did not consider one would be justified in denying the existence of viruses of low potency, nor the possibility that such viruses, under favourable conditions, might later acquire more dangerous characteristics. He believed that in connection with swine fever their chief need at present was further investigation, directed more particularly towards such practical ends as improved methods of diagnosis.

Mr. H. G. Lamont (Belfast) said that Mr. Powley was to be congratulated on the discussion which he had provoked. He desired to ask Mr. Beckett if he attributed the deaths in pigs between the ages of ten days and four weeks, of which he had spoken, to anæmia or to necrotic enteritis?

Mr. F. Beckett replied that all his observations had been directed to showing what they were up against. The only evidence he had in those pigs up to the age of four weeks, that had been constant, had been the anæmia—which persisted, in spite of the feeding of ferric oxide to the sows.

Mr. H. G. Lamont said that those remarks were entirely in accordance with the experience he had gained on this subject. Anæmia of pigs was a very serious problem in Northern Ireland and the work he did on that subject in 1927 showed that it was one of the biggest problems confronting the pig industry there.

The failure to improve the condition by the administration of ferric oxide to the sow could be explained by the fact that this practice would not increase the iron content of the milk. It had been suggested that the loss of these young pigs was a seasonal thing, and was due to the severity of the weather: he would suggest that it was due to the fact that in the winter, in the cold, dark months, the young pigs were not allowed outside under the mistaken belief that they would perish from cold—when allowed outside they secured certain factors which prevented them from becoming anæmic.

Mr. Beckett had made mention of a form of diarrhœa that was found in those young pigs at that age. In the earlier work which he had done on that subject he had found that quite a number of anæmic pigs were constipated; a more extended experience, however, had shown that they also got diarrhœa commonly present. He wished to mention that in 1927 they had treated a number of anæmic pigs affected with diarrhœa, using a mixture made up by dissolving 3 drachms of ferric sulphate and 1 drachm copper sulphate in 1 pint of water, the daily dose for each piglet being 1 teaspoonful. The diarrhœa very quickly disappeared, and this treatment had been used successfully on several similar outbreaks of diarrhœa. He mentioned this point in the hope that any veterinary surgeon interested might use this prescription and record the results in *The Veterinary Record* for the information of other people.

Mr. Beckett had made reference to pneumonia in swine. He would like to ask Mr. Beckett the number of apparently healthy pigs he found to be entirely free from pneumonia. He had heard one or two veterinary meat inspectors suggest that that was a very common finding in pigs, *i.e.*, consolidation of portions of the anterior and dependant lobes of the lungs.

One of the questions that had been raised was the effect of over-crowding on pigs, with particular regard to the use of a small common paddock where the pigs were turned out and where the ground was in consequence continuously soiled by manure. In Northern Ireland they had tried to get over that difficulty by inducing pig breeders to lay down concrete yards, which could be cleaned and hosed out daily. Green food was fed from racks in these yards and sods were cut daily for the young pigs to root through. This practice undoubtedly reduced the incidence of diseases favoured by overcrowding of pigs on small grass paddocks.

Proceeding, Mr. Lamont said that, in the discussion on Captain Pillers' paper, he had intended to ask what agents he recommended for the expulsion of worms from swine. Oil of chenopodium had been mentioned, but personally he favoured santonin. Santonin undoubtedly was expensive, but the fact that individual dosage was not necessary and that the treatment could be given to large numbers in their food was of considerable economic and practical importance. Most farmers cheerfully paid the extra price on account of the great saving in labour and trouble of dosing pigs. In reference to the question of coccidiosis, in 1927 he examined a large number of samples of fæces from pigs, using the sugar flotation method. In occasional samples they found that the top layer of liquid in the centrifuge tube was often full of oöcysts, but he had no evidence to show that they were causing disease. He would really like to know what were the symptoms of coccidiosis in pigs. There was no diarrhœa in these particular pigs; as a matter of fact, they were constipated.

Mr. F. Beckett, replying to Mr. Lamont, said that he blamed ascarid worms for the pneumonia found in young pigs. In dealing with these, he had used all the common vermicides, and he now used oil of chenopodium, because it was somewhat cheaper than santonin. He used 10 minims of oil of chenopodium in two tablespoonsful of linseed oil, and they could dose 60 pigs in one-and-a-half hours. As a result, the yards were full of parasites when they first started; later, of course, their number was reduced.

Dr. Crowther (Principal, Harper Adams Agricultural College), who, before the session terminated, was invited by the Chairman to make some observations on the subject before the Section, said that he could assure them that he was not going to detain them with any attempt to give them an account of his methods of feeding pigs, but, with their indulgence, he would like to venture one or two remarks from the point of view of nutritional work as to the interdependence of nutritional and pathological factors.

He had been continuously engaged now for

some 30 years in carrying out nutritional experimental work with farm livestock—for the first half of that period with dairy cows, and for the second half with pigs, which was still going on. During that period he had often been brought into contact with pathological factors that were cutting right across his own particular studies.

Firstly, there were the more direct troubles due to the presence of toxic substances or irritant substances in the diet, and from his own experience he could say that the farmer and his adviser in time of trouble could take nothing for granted in the diet; every item should be scrutinised most rigidly. He need only recall, by way of example, the thousands of calves that had probably died of linseed poisoning through the presence in linseed cake of the glucoside that, under certain conditions, liberated hydrocyanic acid, often in lethal doses. As a further illustration he might recall that once he received from a farmer a sample of a powder that was being offered to him as lime at a cheap rate. They found it was alumina.

He was sure that, from the nutritional aspect, that question of interdependent effects went far more deeply than any toxic or irritational effect. One could not ignore the environment in which any virus or bacterium found itself, and in the determining of that environment there was, he was sure, no single factor of greater importance than the nutritional factor. He did feel, therefore, that so far as their nutritional work was concerned, they would never get the full results that were required, so long as the nutritionist had to work on his own. The nutritionist and the pathologist should work together on teamwork lines. Moreover, although he could not speak in this respect from experience, he should be surprised if the same thing did not apply in the reverse direction to their pathological research. (Applause.)

THE REPLY

Mr. Powley stated that he was in the very happy position of having very little to which to reply, because each individual speaker, as he rose, had answered the query or queries of the previous speaker.

He would like to express his thanks to Mr. Beckett for the valuable information he had placed before them. It was information they had been wanting for many years.

He was loth to offend the sensibilities of both Mr. Beckett and Captain Pillers by showing them the ulcer again—(laughter)—but probably some of the members would appreciate the opportunity of having a look at some of the specimens he had brought for their inspection. (Hear, hear.) There was a case of experimental necrotic enteritis—perhaps Captain Pillers would like carefully to scan that one—(laughter)—and when he used the term "necrotic enteritis" he did so deliberately, because we as veterinary surgeons in this country did not officially recognise the condition.

On the question of ulceration, he must emphatically state that one could not dissociate ulceration from swine fever; one must take it into consideration with all other factors—you did get it, and you must take notice of it.

Captain Pillers had asked him to state the arguments for having to send material to a laboratory. He was afraid that was a question of policy which he could not answer. Captain Pillers would have to transmit that query to No. 7, Whitehall Place.

Proceeding, Mr. Powley said that he was rather interested in Professor Wooldridge's remarks on bowel lesions in whey-fed pigs. He had seen similar lesions when working in Cheshire, and he could substantiate all that Professor Wooldridge had said on that point.

Regarding Mr. Lamont's observations on coccidiosis, he understood that in Canada they were having fairly heavy outbreaks of coccidiosis in swine, and he thought we got them here, but they could not get anybody to diagnose it. We did not look sufficiently in this country, and we did not make sufficient counts of the fæces.

Concerning the feeding of ferrous sulphate and copper sulphate to small pigs, those observations of Mr. Lamont interested him. Diarrhœa in sucking pigs caused terrific losses; it was a very important problem and one that should be tackled.

He thanked them for the way in which they had listened to his paper. He felt that the effort of preparing the paper had not been wasted, and that some good would evolve from it. (Applause.)

The following resolution was moved for submission to the adjourned Annual General Meeting: "That the Council of the Association be requested to appoint a Committee to investigate the question of the diagnosis of Swine Fever."

Captain A. MacLean (Veterinary Officer, Belfast Corporation) and representatives of the Belfast Markets, Corporation, and Abattoir, and the Pig Commission appointed to enquire into the pig industry of Northern Ireland, visited Smithfield Market recently, and were received by the Chairman of the Markets Committee, the Market Superintendent, and Lieut.-Colonel T. Dunlop Young, M.R.C.V.S., and others. The visitors were interested in the possibility of developing the trade in fresh porkers between Northern Ireland and Smithfield as against baconers for the Irish bacon trade, and the practicability of the development of both sections of the industry. Mr. Twigg and Mr. Spanjer expressed their views upon the types of pigs best suited to the London trade, while Colonel Young gave a brief dissertation upon the different breeds of pigs.

The Veterinary Record

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SWINE FEVER: PROBLEMS OF DIFFERENTIAL DIAGNOSIS

ABOUT 30 years ago two American investigators (de Schweinitz and Dorset) showed that swine fever was due to a filterable virus, and that the bacterium previously thought to be the cause was a secondary invader only, although the presence of intestinal lesions was ascribed to the action of the latter. We pin our faith to this much, but the remainder of our knowledge about swine fever and similar conditions is vague and unreliable. In the paper presented by Mr. Powley to the Experimental Pathology Section of the N.V.M.A. Congress this summer at Llandudno, and reproduced in this issue, it is stated that "the differential diagnosis of swine fever is never an easy subject to write about as, in the present state of our knowledge, it has not yet been freed from uncertainty, indefiniteness and difficulty." Subsequent speakers revealed the negligible information we have at our disposal regarding pig diseases in general. As pointed out by Mr. Pillers in the discussion, during 1932 there were 11,576 reported cases of swine fever, and of these, only 1,555 (13·4 per cent.) were confirmed. This shows the high measure of disability under which pig breeders are labouring. The fact that the root of this lies in our lack of knowledge, makes the position the more lamentable. A general hope was expressed in the discussion on Mr. Powley's paper that intensive research into diseases of pigs, which is long overdue, will be begun shortly. We are glad to be told that a special committee to co-ordinate research in swine fever and necrotic enteritis has been appointed by the Agricultural Research Council, and that more extended swine fever research is contemplated in the immediate future.

That we have at least three types of disease which are of a somewhat similar nature would appear to be the case.

(*a*) Swine fever due to a virus, a septicæmia which, according to a recent publication by Doyle (*J. Comp. Path.*, 1933, *46*, 25) is characterised in its acute form by petechial hæmorrhages and enlarged lymphatic glands. Ulceration may or may not be present, and, according to the same author, its extent probably depends upon the intestinal flora.

(*b*) Swine fever due to the virus but associated with infection with one of the salmonella group. Not only has *Bact. suipestifer* been isolated from such animals but also *Bact. enteritidis*, *Bact. ærtrycke* and salmonella of the Derby type.

(*c*) A disease which may be called necrotic enteritis or pig paratyphoid, similar to if not identical with the *Ferkeltyphus* of Germany. The cause of this is undoubtedly a member of the salmonella group, the bacteria isolated from this type of disease being of the Glässer-Voldagsen type. It would be interesting to know if a similar type exists in this country, and conversely if the disease may be caused by the more common types of bacteria of the salmonella group which are present here.

Attempts have been made by Manninger (*Deut. tier. Woch.*, *40*, 1932) to differentiate between these somewhat similar diseases. His findings indicate the difficulties of differential diagnosis and the small value of bacteriological methods in many such cases. The isolation of *Bact. suipestifer* may indicate either a pure bacterial infection or infection with virus and the bacteria in question. This helps but little in the determination of the presence of the swine fever virus. The present methods available appear to be prompted by a knowledge of the epidemiological features and the age of the pigs taken in conjunction with *post-mortem* findings. There is still a considerable lack of knowledge and we reiterate our pleasure at the news that research into these diseases is contemplated; we would suggest that to obtain the best results some measure of decentralisation of effort would be desirable. The wider the net, the greater the number of fish caught.

We would venture to formulate certain aspects of these diseases on which more information would be particularly desirable. The greatest need is a reliable method of determining the presence of virus. At present the only sure method appears to be the inoculation of filtered material into another pig. This is naturally impracticable for large-scale work. Histological methods may prove of value, or the discovery of a convenient and susceptible laboratory animal still more so. An adequate and full description of the differential diagnosis will no doubt eventually be available for local inspectors and practitioners, and in this connection, we ask for their patience, for research is the establishment of truth and this is often no easy matter. Other points of interest lie in the distribution of the virus throughout the animal body at different periods of the disease, whether there exists in this country more than one type of virus and whether it is possible to immunise animals actively without spreading the infective agent.

There are many more lacunæ in our knowledge. It has been taught since the days of Uhlenhuth and his co-workers (1908, *Arb. Kais. Ges.*, 27, 425) that members of the salmonella group are normal inhabitants of the pig. Are they? This teaching is denied by Savage (1918, *J. Hyg.*, *17*, 34) and Lovell (1932, *J. Comp. Path.*, *45*, 27) in this country and by Jordan (1918,

J. Infect. Dis., 22, 252) in America and the recent article by Doyle tells us that ulceration may be present in the intestines of pigs which have died of swine fever and yet *Bact. suipestifer* cannot be isolated. Not only is it important to clear up this matter so that methods of prevention intended to help the pig industry may be established, but there is a very definite public health aspect. Certain members of the salmonella group, *e.g.*, *Bact. suipestifer*, are pathogenic for human beings and may cause not only food poisoning, but also septicæmia and arthritis, especially in the young and in debilitated subjects. The paths of infection are obscure and rarely traced. The problems are many, varied and of absorbing interest and those who help in their solution will merit the thanks and praise of the pig breeders, the veterinary practitioners, public health officials and the public.

Clinical Report

TWO INTERESTING "FOREIGN BODY" CASES IN THE DOG

W. H. HORNE, M.R.C.V.S.
WATFORD

Case No. 1. *Subject.*—Smooth-coated retriever bitch, aged seven months.

History.—Had been ill for two days, being occasionally sick and showing some difficulty in walking.

Examination.—Abdominal palpation revealed the presence of a foreign body, the posterior end being situated just in front of pelvis; the anterior end was too far forward to be palpated. The foreign body was straight and rod-like to the touch.

Treatment.—Operation.

Laparotomy revealed the foreign body to be entirely in the stomach, the stomach being stretched in a straight line and reaching back almost to the pelvis. A small incision was made in the stomach wall and the foreign body was removed. It proved to be a wooden meat skewer, 7½-in. in length, with its blunt end posterior.

The stomach incision was closed by Czerny-Lembert sutures, using "Mersutures" (catgut with eyeless needle attached). The abdominal cavity was closed in the usual way.

Recovery was uneventful, the dog being discharged on the eighth day.

Remarks.—The interesting point in this case was the length of the skewer, as one would deem it almost impossible for a puppy to swallow an unyielding rod of such a length.

. . . . .

Case No. 2. *Subject.*—Scotch terrier dog, aged four years.

History.—The dog had been ill for two days, refusing to feed and being continually sick. The bowels had not moved for a number of days.

Examination.—The temperature was slightly elevated and the pulse very fast and weak.

Abdominal palpation revealed extensive fæcal impaction, with a good deal of pain on manipulation, particularly over one part well forward.

Diagnosis.—Coprastasis with the possibility of the presence of a foreign body.

Treatment.—Liquid paraffin and enemata. Some impacted fæces were got away by the enemata, but, after 24 hours, as the general condition of the dog had become somewhat worse, it was decided to operate.

Laparotomy revealed a foreign body completely occluding the lumen of the small intestine, with acute inflammation of the bowel extending for about a foot anterior to the stoppage.

The foreign body was, with difficulty, moved a few inches, to a less congested part of the bowel, and removed. It proved to be a piece of a rubber "bone."

The intestine was closed by Czerny-Lembert sutures, using "Mersutures," and the abdominal cavity was closed in the usual way.

Subcutaneous injections of normal saline were commenced immediately following the operation, 300 c.cs. being given daily, with occasional injections of brandy.

In spite of this, on the third day the dog collapsed—temperature subnormal and pulse scarcely perceptible—and it was thought the dog could only live a few hours. As a last resort, champagne *per os* was resorted to, two teaspoonsful being given every half-hour. This had a spectacular result, a marked improvement being noticed in twelve hours. He was kept on champagne for three days and steadily improved. Recovery after this was uneventful except for two small abscesses forming at the seat of subcutaneous injections.

Remarks.—This case is interesting because of the remarkable effect of the champagne, an apparently hopeless case recovering.

By a decision of the Milk Marketing Board, the cheap distribution of milk at the Penrith Auction Mart on Tuesdays is to be discontinued, and surplus supplies are to be provided for pig feeding.

For many years the milk from the newly-calved cows sold at the weekly auction marts has been sold at a nominal price to very poor people.

It is now an offence to sell milk at less than the agreed minimum price for an area.

* * * * *

Horse-breeding for export purposes, which for almost 25 years has been on the down-grade in Ulster, seems now to be on the road towards revival. According to statistics available, during the first nine months of 1933 the number of horses sent to the United Kingdom through Belfast was 2,786, or twice the number of exports in the same period of 1932, as well as the largest figure yet reached in a whole year for a long time.

INTERNATIONAL DISCUSSION ON MILK AND BREAD

Abbreviated Report of the Section on Milk

Six papers on subjects relating to milk were read and discussed at the Symposium on Bread and Milk arranged by The Food Group of The Society of Chemical Industry and held in London on November 23rd and 24th. Two of these were concerned with the metabolism of lactic acid bacteria and were discussed first. The titles and authors of these communications were: (1) "Some Remarks on the Metabolism of Lactic Acid Bacteria and on their Rôle in Butter Making," by Professor A. M. Kluyver (Delft, Holland), and (2) "Hitherto Unknown Activators for the Growth of Lactic Acid Bacteria," by Professor S. D. Orla-Jensen (Denmark). These were followed by a discussion on papers by F. C. Minett and E. J. Pullinger (Royal Veterinary College, London), and by Professor H. D. Kay (Reading).

In their paper on "Disease-producing Organisms in Milk," Minett and Pullinger explained that the work was undertaken (1) to obtain further information as to the incidence and distribution in different classes of raw milk of three kinds of disease-producing bacteria, *viz.*, *M. tuberculosis, Br. abortus* and the streptococci of mastitis in cows; and (2) to study the effect of pasteurisation by the holding method on these organisms, as practised commercially at a number of plants. The milks examined were (*a*) ordinary 3,000 gallon, rail tank mixed milk just prior to and immediately after pasteurisation; (*b*) mixed milk from individual certified and Grade "A" (T.T.) herds; (*c*) Grade "A" (T.T.) bulked milk, before and after pasteurisation and (*d*) ordinary raw mixed milk from single farms. The following table represents the results obtained.

Milk	No. of Samples	*M. Tuberculosis*		*Br. Abortus*		Mastitis Streptococci	
		+	—	+	—	+	—
Certified	26 ...	21 ...	25 ...	17 ...	9 ...	16 ...	10
Grade A (T.T.) ...	39 ...	1 ...	38 ...	31 ..	8 ...	29 ...	10
Grade A (T.T.) raw ...	11 ...	1 ...	10 ...	11 ...	0 ...	9 ...	0
Grade A (T.T.) raw pasteurised ...	6 ...	0 ...	6 ...	0 ...	6 ...	1 ...	5
Rail tank, raw ...	43 ...	43 ...	0 ...	27 ...	16 ...	33 ...	0
Rail tank, pasteurised	43 ...	0 ...	43 ...	0 ...	43 ...	0 ...	33
Ordinary raw mixed ...	90 ...	19 ...	71 ...	— ...	— ...	35 ...	55

These results are discussed by the authors, who concluded with the following paragraph:

"In conclusion, there is another aspect which we feel merits attention: it is that the observations emphasise the wide distribution of contagious abortion and mastitis among the cattle population of this country and, by implication, the necessity of controlling these diseases. It may be said with much truth that the problem of reducing animal diseases, such as tuberculosis and abortion, and that of safeguarding human health are entirely distinct. . . . . There would appear, however, to be no real reason why—as is sometimes assumed—the policy of rendering milk safe by heat-treatment should militate against a policy designed to eradicate animal diseases which happen to be communicable to man. Pasteurisation of milk is applied in part for purposes which have nothing to do with animal disease, just as the control of contagious diseases in animals has objects unconnected with questions of human health. It is to be hoped, therefore, that the two policies may be allowed to develop side by side."

In opening the discussion on the paper, Dr. Minett added that there were comparatively simple methods of control available for these three cattle diseases. They had experience of one herd which had proved to be negative to all three diseases on cultural examination for three-and-a-half years.

Professor H. D. Kay introduced his paper on "The Improvement of the Nation's Milk Supply." He said that improvement in quality accompanied by a thoroughgoing endeavour to educate the public in dietetics are the all-important factors if milk production is to be placed permanently on a stable basis. Cow's milk should be increasingly incorporated in a baby's diet from six months, and at nine months the child should be taking one-and-a-half pints a day. This daily ration should be maintained throughout childhood and adolescence. A pint a day is probably sufficient for the adult. During pregnancy and lactation considerably more is required and illness and advanced age may require increased quantities. Averaging this out, the daily ration should be one-and-a-quarter pints, whereas the present daily consumption is about 0·4 pints. The reasons for this low consumption are ignorance of the real nutritive value of milk, low purchasing power of the poorer classes and the too vocative pro-pasteurisation propaganda. The farmer could relatively soon increase the yield of liquid milk

and so the quantitative problem is largely educational. The technique of clean milk production compares very favourably in this country with that in any other. This standard of clean milk production would rise still further if all the big distributing companies insisted on a reasonable prepasteurisation standard. Pasteurisation will not make dirty milk clean. Pasteurisation in bottle, or mechanical capping under bacteriologically satisfactory conditions, seems to be a minimum requirement for " safe " milk, assuming that pasteurisation is to be the sole barrier against the possibility of disease. In order to ensure the hygienic quality of the milk supply, having regard to cleanliness and absence of risk of disease, all milk for liquid consumption, whether pasteurised or not, should have a bacterial count on delivery to the distributor of not more than 100,000 viable organisms per c.c. and *coli* absent in 0·1 c.c. No milk should be sold for liquid consumption in the raw state which does not come from herds tuberculin-tested at not more than six-monthly intervals and which undergo a competent veterinary inspection four times per annum. Further, all commercial heating of milk should be done under license, under the direct responsibility of a competent, certified, plant manager and under bacteriological control, and the product should be labelled " pasteurised milk." Only three grades of milk should be allowed, *e.g.*, Class I (raw, tuberculin-tested), Class I pasteurised, and Class II pasteurised.

Sir. Weldon Dalrymple-Champneys remarked that as the public was bound to know sooner or later what the present state of milk is, the sooner it knew the better, as then things would be done. The conditions on many farms were still appalling. Certified and Grade A (T.T.) milks were just as much affected with contagious abortion as other herds. There is probably very much more undulant fever infection in the country than is as yet realised. It is possible that some degree of immunity results from drinking infected milk in childhood, but this is not a method of immunisation to be advocated.

Dr. W. G. Savage considered the consumption of milk to be scandalously low. The publicity given by the health authorities to the conditions of the milk supply definitely lowered its consumption but it was at present impossible for the medical profession to " boost " milk, as it would as soon as the milk was safe and clean. Fortunately things were improving and the medical man and the agriculturalist were getting nearer together.

Dr. Kramer said that a flourishing dairy industry was essential to the production of a " safe " milk.

Mr. W. Cohen, a producer, pointed out that dairy farmers were not afraid of facts, but they were of theories. He reminded the meeting of the enormous improvement that had taken place in the production of milk during the last ten years, and that the incidence of bovine tuberculosis in human beings had been going down during that period. At present the aim should be to secure a " reasonably safe " milk. It was necessary to remember that producers had to work at small profit and that to improve the quality of milk money must be spent.

Mr. Tustin (United Dairies) reminded the Congress that there was a plentiful supply of " safe " milk, *viz.*, pasteurised milk.

Dr. Anderson stated that manufacturers required a good standard milk, otherwise very severe losses might result in the manufacture of butter, cheese, condensed and dried milks.

Dr. Minett reminded Professor Kay that one of the severest causes of a reduction in the quantity and quality of milk was disease of the cow; *e.g.*, contagious abortion and mastitis very considerably reduced the milk yield, whilst mastitis, besides resulting sometimes in the presence of pus and blood serum in the milk, considerably reduced the lactose content.

After Professor Kay's reply the Chairman, Dr. W. W. Jameson (London School of Hygiene), summed up the discussion. After summarising the findings of Dr. Minett and Mr. Pullinger, the Chairman remarked that tuberculosis, contagious abortion and mastitis are the causes of considerable loss to dairy farmers, and on this account every attempt should be made to eliminate these diseases—quite apart from the obvious necessity of protecting human beings against any risk of infection. We thus have a position sufficiently serious both to agriculture and to the public health to require the foundation of a definite policy.

After stating the main points of Professor Kay's paper, the Chairman remarked that " on the subject of 'safe' milk Professor Kay, I fancy, finds himself on somewhat delicate ground. He knows as well as I do that neither the agriculturalists nor the public health authorities have any business to allow milk to be sold to the public if it is known to contain organisms that may produce disease. . . . Professor Kay says 'evidence that *some* young children can become tuberculous through drinking infected milk is well established.' I would remind him that about 6 per cent. of all deaths from tuberculosis in England and Wales are caused by the bovine type of organism and that about 2,000 deaths, mostly in children, occur annually from this cause and that at least 4,000 fresh cases of bovine infection develop each year. . . . It should be our ideal to provide the public with a milk supply free from all risk of infection, and this means more than the elimination of diseased animals from our dairy

herds. . . . There is no reason, as Dr. Minett points out, why the policy of rendering milk safe by heat treatment should militate against a policy designed to eradicate animal diseases which happen to be communicable to man."

On the following day Professor J. C. Drummond (University College, London) read a paper on "Comparative Studies of the Nutritive Value of Raw and Pasteurised Milk," and Professor G. S. Wilson and Mrs. M. P. Cowell (London School of Hygiene) gave a contribution entitled "Comparison of the Nutritive Value of Raw and Pasteurised Milk for Mice."

From his experiments on rats Professor Drummond concluded that there was no evidence that pasteurisation adversely affects the nutritional value of milk. Raw milk, supplemented by biscuit prepared from white flour, was insufficient to enable a young female rat to produce and rear a normal litter of young. The addition of vitamin B may adjust the balance of this diet so that satisfactory reproduction can occur, whilst there is some evidence that amounts of copper and iron above those required to maintain the normal blood picture may influence reproduction beneficially.

Professor Wilson and Mrs. Cowell concluded that diets consisting of milk (raw or pasteurised) and white flour biscuit were inadequate to promote normal growth and that young mice kept on this diet usually died within a few weeks in an emaciated and often severely anæmic condition. (Two groups, each consisting of 151 mice, were compared.) The addition of a copper and iron mixture to this basal diet improved growth and development and prevented the occurrence of anæmia, but did not generally suffice to enable the does to rear their litters. The addition of yeastrel to the basal diet overcame this difficulty, and when both mineral mixture and yeastrel were added, growth, reproduction and rearing of litters appeared to be almost as satisfactory as on a normal stock diet. Hence, so far as mice are concerned, cow's milk appears to be deficient in iron and copper, and in some factor, possibly of vitamin nature, which is required for successful lactation. Comparing the behaviour on the different dietaries of the two groups of animals, all of which had been reared by does on stock diet and were at the beginning of the experiment about half grown, it was found that there was little difference between the nutritive value of raw and of pasteurised milk in influencing general development, survival time, production of litters, or successful rearing of the young. With mice brought up from birth, however, by does on a milk-and-biscuit diet, there was a considerable difference, the average weight of the mice at weaning time being significantly heavier in the raw than in the pasteurised milk groups. The evidence suggests that, while raw or pasteurised milks appear to be of approximately equal value for the growth and reproduction of mice subsequent to weaning, for the development of mice during the first four weeks of life raw milk appears to possess certain advantages over pasteurised milk.

Professor Kay remarked that experiments at Reading had shown that raw milk was better than pasteurised milk for growth, although the differences were not very great. Pasteurisation should be used with caution.

Dr. Bartlett stated that actually there was a difference of height in the children fed on raw and pasteurised milk in Lanarkshire; the taller group had had the raw food. Professor Drummond's figures were not statistically accurate as he had not used enough rats.

Professor H. E. Armstrong considered that Professor Drummond's "controls" were too variable.

In his reply, Professor Drummond said that the raw and pasteurised milk should be tested over the normal milk-drinking period and that the milk examined should actually be from the same species as the experimental animals. Mrs. Cowell added that large-scale experiments were essential.

W. R. W.

H.M. STATIONERY OFFICE PUBLICATIONS

The undermentioned have been published recently. Copies can be purchased through any bookseller, or directly from H.M. Stationery Office, at the following addresses: London: Adastral House, Kingsway, W.C.2, and 28, Abingdon Street, S.W.1; Cardiff: 1, St. Andrew's Crescent; Manchester: York Street; Edinburgh: 120, George Street.

	Price Net. s. d.	*Post Free.* s. d.
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Vol. xxi, Part I. Report on the Acreage and Production of Crops and Number of Livestock in Scotland; with Summaries for Great Britain and Ireland. (49-7-1-32)	0 9	0 10
Imperial Agricultural Bureaux:—		
Agricultural Research Workers in the British Empire; List of, 1933. (88-602-0-33) ...	2 0	2 4

Annotation

VACCINATION WITH B.C.G.

The merits and demerits of vaccination with B.C.G. were fully considered at the Eleventh International Veterinary Congress in 1930. In view of the various opinions expressed by the Reporters and by speakers in the subsequent discussion, it was inevitable that the majority should be in favour of suspending judgment, agreeing with M'Fadyean that experiments should be continued "as long as necessary for the formation of a reasoned opinion as to the value of the method." In the meantime, fresh investigations have been initiated and there has been no diminution in the efforts which are being directed towards an appraisement of the innocuousness and the immunising value of B.C.G. for farm animals. Nevertheless, it must be admitted that the position still remains in *status quo*.

Watson, who was, and is, definitely opposed to the method, asserted in 1930 that, in his opinion, B.C.G. was not entirely harmless and was of limited value as a prophylactic agent. In his most recent article, the author's abstract of which appears in this issue, it will be noted that as a result of further observations, he now suggests that the strains of B.C.G. with which he was originally working were not entirely devoid of pathogenicity for the guinea-pig, but that further subcultivation has succeeded in "fixing" the organism so that it is now incapable of producing progressive reinoculable tuberculosis. His opinion regarding the low order of immunity induced in cattle remains unaltered. The Committee on Tuberculosis of the American Veterinary Medical Association have also adopted a cautious attitude. In their report of 1932 they admitted that vaccination might confer some degree of resistance of brief duration, but that the immunity diminished from year to year, while the results of revaccination were still to be determined. They were particularly concerned with the possibility of the conversion of vaccinated animals into carriers of virulent tubercle bacilli. Their conclusions were based upon the results of experiments reported by their own workers (Schroeder, Cotton and Crawford; Watson, McIntosh and Konst; Rankin; Larson and Evans; Haring, Traum, Hayes and Henry).

On the other hand, there is an impressive array of evidence in the opposite direction, chiefly from various European sources. In addition to the controlled experiments by Guérin, Brinet and other French investigators, mention may be made of the field trials of Ascoli in Italy on more than 5,000 head of cattle and of Gerlach in Austria on over 4,000 animals (up to 1932), which cannot be ignored. Calmette and Guérin have categorically stated on more than one occasion that the absence of tuberculous lesions in vaccinated and revaccinated animals has shown that in heavily infected herds over periods extending up to six years, the vaccination of the young calves, coupled with ordinary hygienic precautions and the gradual elimination of the infected adult stock, renders feasible the building up of clean herds.

In this country, the recent work of Buxton and Griffith has focussed attention upon the method of applying the vaccine which will produce the most satisfactory degree of resistance and their experiments have indicated that the intravenous route, by provoking a more solid immunity, presents definite advantages over the subcutaneous or other methods of administering the vaccine. Ascoli, on the other hand, is not in favour of this route, on the ground that the localisation of the vaccinal organisms in the lungs facilitates the development of secondary infections, an objection which does not pertain to the subcutaneous method.

In the pig the most important advances are those of Jundell and Magnusson, and of Hayes, Haring and Traum. Their reports have proved far from encouraging, for they have entirely failed to demonstrate any appreciable degree of immunity to artificial infection following the administration of B.C.G. by different routes.

In this country, there is an urgent need at the present time for a series of carefully controlled experiments designed to furnish information on the possibility of building up clean stock in infected herds by the vaccination of young calves and, if necessary, their revaccination at appropriate intervals. It is in this way alone that the valuable information gained by experimental research can be translated to the field of ordinary farming conditions.

In surveying the merits of vaccination, it should be borne in mind that in the United States and in Canada, thanks to a general low incidence of tuberculosis and the successful prosecution of widespread schemes of eradication, the employment of vaccines is of minor importance. In European countries, where the incidence is undoubtedly high, the elimination of the disease by segregation or slaughter is often impracticable and any method of vaccination which offers a reasonable chance of success must, therefore, receive careful consideration.

R. E. G.

Thornbury F.U., at its annual meeting, decided to send a resolution of protest to the County Council against the slippery condition of the roads, which rendered them dangerous for both cattle and horses. It was stated that chippings were thrown down without being rolled in, and the opinion was expressed that sand would be better.

Abstracts

[**Studies on Bacillus Calmette-Guérin (B.C.G.) and Vaccination against Tuberculosis.** Watson, E. A. (1933.) *Can. Jour. Res. 9.* 128-136. (Author's abstract.)]

Vaccination trials and biological studies of B.C.G. have been carried on for a period of over eight years and are still continuing. Under conditions of continuous exposure to natural infection through cohabitation with tuberculous animals, trials varying in duration from two months to four-and-one-half years have been completed on 44 vaccinated cattle and 28 unvaccinated controls. In trials of short duration the percentage of cattle free from tuberculosis is slightly in favour of the vaccinated. In all cattle over two years of age tuberculosis was present to a greater or lesser degree. Judged by slight, moderate and extensive tuberculous involvement, there is some evidence of a greater resistance in the vaccinated cattle up to two-and-a-half years of age, 26 per cent. of which showed extensive generalised tuberculosis, as compared with 53 per cent. of the unvaccinated. But in the age group ranging from two-and-a-half to four-and-a-half years no greater resistance is found in the vaccinated than in the unvaccinated cattle. It has not been possible tc demonstrate a true lasting immunity by this method of vaccination, and such increased relative resistance as B.C.G. may confer during the early months of life declines and soon disappears, and fails to protect cattle exposed for two years to natural sources of infection from developing typical tuberculosis.

The attenuated virulence and potential pathogenicity of B.C.G. have been studied for a period of over eight years in three original strains received in the years 1924, 1925 and 1927, and in the cultural descendants of each strain up to the year 1932. Each strain proved to possess an unfixed, potential virulence capable of exaltation on the one hand, and of complete attenuation or reduction on the other. This virulence, manifested but rarely and only in the earlier descendants, 1924-1928, declined under serial cultivation and periodic return to the special bile-potato media and apparently died out in the 1928-1929 generations, for none of the subsequent descendants tested proved capable of causing progressive reinoculable tuberculosis in laboratory animals.

* * * * *

[**A New Method of Diagnosis of Diseases caused by Filterable Viruses: Its Application to the Diagnosis of Swine Fever.** (Trans. title.) Sarnowiec, W. *Bull. de l'Acad. Vét. de France. 6.* 7. 322-324.]

Sarnowiec records that, in the course of his investigation of the immunising value of defibrinated blood compared with that of serum in swine fever, he noticed that pigs already affected reacted to the injection of defibrinated blood and that at the point of inoculation inflamed and painful nodules developed, accompanied by a general reaction, followed by death. Such a marked local reaction with aggravation of the pathological condition aroused the suspicion that it might be an allergic reaction and not a simple inflammatory process that followed the inoculation. An investigation was then undertaken and satisfactory results were obtained by the intradermal inoculation of a new antigen on the inner surface of the thigh, which is both a well vascularised area and near lymphatic glands. The antigen was composed of a mixture of equal parts of blood and oleum ricini, used in doses of from 0·2-0·5 c.c.

In infected animals one observes an inflammatory local reaction, a thermal and a general reaction. Local reaction only appears in animals contaminated at least 70 hours, and a thermal reaction in animals infected from at least 80-86 hours; the latter is accompanied by clinical symptoms—apathy, dyspnœa, inappetence and shivering. The intradermal reaction is hot and painful and varies in size from that of a nut to that of a fist; it is generally observed at the end of ten to twelve hours and may last for 48 hours. In addition, the inguinal glands are enlarged, inflamed and painful. The temperature may not return to normal and the disease becomes serious. In animals in the chronic state of swine fever the reaction is less marked, though appreciable, and the reaction is only difficult in subjects so weakened that they do not react. Healthy subjects, if they react, only do so very slightly to the intradermal injection of the antigen. They only show a swelling unaccompanied by heat or pain and there is no reaction of the inguinal glands.

Intradermal injection of ol. ricini alone gave rise to no reaction. In using the antigen in a herd not known to be infected with swine fever it is recommended that a few of the sick pigs to be tested should be strictly isolated, as one is using a virulent material. J. S.

* * * * *

Clinical Abstracts

[**A Summary of Cases Treated with Spleen Extract.** Holness, H. J. 1933. *Jour. R.A.V.C. 5.* 1.]

The question of the therapeutic value of spleen extract in a variety of conditions of obscure etiology, such as canker and seedy toe, is one which is exercising the minds of many equine practitioners at the present time. For this reason they will welcome this further evidence of the readiness of the officers of the R.A.V.C. to prosecute investigations which, for many reasons, they are more favourably placed

to undertake than is the veterinarian in general practice.

Lieut.-Colonel Holness here records the results of the treatment of three conditions—canker, seedy toe and lichen tropicus—by injections (intramuscular or intravenous) of spleen extract in horses at seven hospitals in the Southern Command. It is satisfactory to note that here, at least—albeit amongst some unsatisfactory results—we have definite and reliable evidence of the cure of canker by this method. A striking example is offered by Canker Case No. 1 at Hospital located at "A," and the brief details are worth giving, as follows: "Initial dose 5 c.c., subsequently 5 c.c. at three-day intervals—35 c.c. in all. Method of employment: intravenous injection. Result: cured after 26 days." Similarly, a cure in five weeks was effected at Hospital located at "F." Some significance attaches to the fact that, at a hospital located at "B," freshly-prepared extract made at the hospital was employed with immediate good results on a case of canker that had resisted lengthy treatment with imported extract, for this suggests that the active principle of the agent is one that quickly loses efficiency.

In regard to the general results achieved, however, the following summary of experiences at the Hospital located at "A" appears typical:—

"*For Seedy Toe.*—Spleen extract injections assist, but surgical treatment is also advisable.

"*For Canker.*—In recent cases spleen therapy is beneficial; in long-standing cases its efficacy is doubtful.

"*For Lichen Tropicus.*—Spleen extract may assist a cure."

Treatment with spleen extract has the merit of cheapness.

W. B.

* * * * *

[Three Accidents affecting the Fetlock Joint in Racehorses. (Trans. title.) Bouchet. *Bull. de l'Acad. Vét. de France. 6.* 7. 307-313.]

In the first case the injury was sustained during a race by the horse jumping a path across the course. Rupture of the suspensory ligament was diagnosed, and an X-ray examination also showed the presence of a fracture of the border of the inner sesamoid bone. The horse was destroyed six days after the accident and at the *post-mortem* examination there were found total dilaceration of the suspensory ligament and lesions of erosion on the cartilage of the articular surfaces of the fetlock joint. These erosions were both in the form of grooves in an antero-posterior direction and flat ulcerated areas.

The second case was clinically identical, although it differed in ætiology, for it was probably caused in jumping, the horse striking the fence.

In the third case the cause was a fall on the road, the off-hind fetlock being affected, and there was great pain on palpation. The lesions answered to treatment and after a month the horse was walking sound, though the fetlock was still enlarged. Laminitis, however, occurred in the near-hind foot, and after a while deformity of the foot was noticeable. On X-ray examination one could detect displacement of the third phalanx in the hoof. On account of the thickening of the off-fetlock this was twice blistered and a year after the injury the horse returned to training without lameness. On account of running badly in its first race the horse was destroyed. At the *post-mortem* examination, thickening of the aponeurosis was found, but the chief lesion was grooving of the articular surface of the joint, in spite of which the animal was not lame.

J. S.

* * * * *

[Intestinal Invagination in a Filly. (Trans. title.) Aubrey. *Recueil de Méd. Vét. de l'Ecole d'Alfort. 109.* 9. 542-543.]

The author fully describes the unusual resistance of a two-months-old filly to what proved to be a fatal intestinal invagination, the illness lasting eleven days.

He sums up the history in three stages:—

(1) Intestinal occlusion by the lesion, arrest of peristalsis, pain and a grave prognosis. The narcotics given are supposed to have checked or stopped peristalsis, while the large bowels continued their functions.

(2) The invagination becomes consolidated and "numbed," the stomach, as well as the duodenum and jejunum, regains its activity, the ileum alone remains refractory "et pour cause"; the cæcum and colon resume function with passage of small amounts of soft fæces.

(3) The invagination becomes gangrenous and diarrhœa fœtid. A catarrhal infection appears with rapid evolution in a young subject, weak by reason of its age and breed.

C. V. W.

NATIONAL PONY SHOW

At a recent meeting of the Council of the National Pony Society, at which Sir Ian Walker, the President, was in the chair, it was announced that the next show of polo and other ponies would take place at the Royal Agricultural Hall, Islington, on Friday and Saturday, March 2nd and 3rd next.

The schedule comprises 49 classes, as follows: polo ponies, twelve; riding ponies, eight; children's ponies, five; Arabs, eight; Welsh ponies, two; Shetland ponies, five; jumping and competitions, nine. Entries close on January 17th, except for the children's classes, jumping and competitions, which will be taken up to the date of the show.

Reviews

[**Poultry Diseases.** By B. F. Kaupp, B.S., M.S., D.V.M. pp. 444, 168 illustrations. Published by Baillière, Tindall and Cox, 7-8, Henrietta Street, Covent Garden, W.C.2. 1933. Price 18s. 6d.]

This, the sixth edition of the work, now totals 444 pages.

Anatomy, physiology and sanitation are dealt with in the first three chapters; the pitfalls of chick rearing and the normal and abnormal appearances of the organs are considered under sanitation.

Chapters IV, V and VI deal with external and internal parasites and protozoa, with recommendations for the clearing of these parasites from birds.

The succeeding chapters mainly treat of diseases due to various causes. In this portion of the work there is a constant recommendation for treatment, which can only be deprecated. Under modern conditions of poultry keeping, treatment is often quite contra-indicated and in many cases only produces carriers which disseminate the disease, and in others produces a bird which cannot become a paying commercial proposition.

Chapter XXIII deals with poultry remedies. To suggest remedies to poultry owners, for whom the book is presumably written, is a danger from the point of view of the spread of the disease. When disease occurs, expert advice should be obtained in order that the correct diagnosis may be ascertained. The indiscriminate dosing of animals only tends to spread the disease, and is a cause of great loss to the owner and to the poultry industry generally.

In describing psittacosis, a disease of parrots and budgerigars, the cause of which is now known to be a filterable virus, there should be pointed out the very great danger of this disease to human beings. It is not necessary for the owner to handle the affected bird to become affected himself: it is highly infectious, and many persons have been very dangerously ill and several deaths of human beings have been recorded.

The book is profusely illustrated and the publishers' part has been very well carried out.

. . . . .

[**Keeping a Dog: Its Training and Care in Health and Sickness.** By Major R. F. Wall, M.R.C.V.S. Published by A. and C. Black, Ltd., 4, 5 and 6, Soho Square, London, W.1. Price 3s. 6d.]

This book, with a foreword by Sir Frederick Hobday, Principal of the Royal Veterinary College, and dedicated to that well-known lover of animals, the Earl of Lonsdale, is intended for the benefit of everyone who keeps a dog as a pet or a friend. It is couched in the simplest language, which is understandable by all. Even breeders and dealers would find it of practical value. It is not meant to be a text-book of veterinary science, though it may be read with interest by members of the veterinary profession and find a place in the libraries of veterinary institutions.

Chapter I deals with the choice of a dog, various popular breeds being described, and two illustrated plates being embodied. In a chapter on purchasing a dog, the wise course of going to the breeder of a particular breed is advised, and in a succeeding chapter some sensible advice is given with regard to making a dog's acquaintance and handling to gain mutual confidence. The important matters of accommodation and housing are well described under the sub-headings of bedding, sanitary arrangements, the kennel, feeding dishes, and the run. The same may be said of the equally important subject of feeding, particularly of puppies and young dogs. The chapters on exercise and grooming, and on training, commend themselves as necessary factors in the career of a dog, while those on sex and breeding, and on the care of puppies are instructive even to those with an expert knowledge of breeding. The chapters on the ailing dog and on common diseases and accidents are specially intended to convey to the mind of the average owner of a dog the nature of the common ailments of the canine race, and when in doubt to appreciate the unwisdom of attempting to treat them himself, except on general principles in cases of emergency, or enlisting the services of an unqualified person, but to consult the duly qualified veterinary surgeon, who, by reason of a high standard of scientific education, and strenuous training in the art of diagnosis and treatment of diseases of animals, is better able to apply relief which dogs in their ailments have every right to expect. The last chapter of the book is devoted to nursing, which, as is well known, is the secret of life or death to the canine patient. As the text says, it is the nurse's duty to take close observation of every indication that the patient gives and to endeavour to interpret those indications correctly, so that discomfort can be intelligently changed into comfort. The book concludes with a glossary of common terms used in canine circles.

The Act passed by the Manx Legislature last session, prohibiting the import of livestock, dead meat, swine and poultry into the Isle of Man except under licence, is to be put into effect on the understanding that the section relating to dead meat, swine and poultry will not be enforced. Farmers have been urging for years that cattle should not be allowed into the Isle of Man from other countries, particularly fat cattle from Ireland, so long as there is a sufficient home supply.

Report

TANGANYIKA TERRITORY

ANNUAL REPORT OF THE DEPARTMENT OF VETERINARY SCIENCE AND ANIMAL HUSBANDRY, 1932

This report, presented by Mr. H. E. Hornby, Director of Veterinary Services, has not, like so many other reports recently reviewed, been appreciably curtailed for reasons of official economy. It comprises nearly 100 pages and is made up of five parts. The first, relating to "Staff and General," is contributed by the Director, as is also the latter portion of Part III, reviewing the research carried out in trypanosomiasis. Part II, on Disease Control, is compiled by Mr. H. J. Lowe, and Part III commences with a Report on the Work of the Veterinary Laboratory, Mpwapwa, by Mr. S. A. Evans. The subject of Animal Nutrition Research is dealt with by Mr. M. H. French, while several writers have contributed to Part IV dealing with Animal Husbandry and Livestock Trade. The report, therefore, bears evidence of team work, and due credit is even given to the African members of the staff, particularly the Native Veterinary Guards, of whom one veterinary officer writes: "A word of praise is due to the Guards who formed this cordon. They had to live for months on end in what must be one of the foulest spots in the Territory; they suffered from malaria and dysentery; two were desperately ill and they all had great difficulty in getting food." The Director also states "these men form the basis of our intelligence service and any success which we may have achieved is due to a large extent to their efficiency . . . They can handle animals, take temperatures and blood smears, and are familiar with the symptoms and methods of control of the most important diseases."

The control of rinderpest, "the objective enjoined at the Pan-African Veterinary Congress in 1929," has been the "ultimate aim" of the department. Mr. Lowe says "there can therefore be no turning back from the task which we have set ourselves and despite disheartening reverses the ultimate successful issue of our endeavours is beyond dispute." The year opened with a wave of the disease which began in 1931 and had by the beginning of 1932, enveloped the greater part of the main cattle areas of the Lake and Western Provinces, with disastrous results. By the end of the year the "wave" had been rolled back northwards, and three-quarters of the cattle areas of the Territory were left completely unaffected by the disease. Various methods were adopted in the endeavour to control it: quarantine *plus* serum, quarantine *plus* vaccine, and modifications of these methods to suit local conditions. These cannot, unfortunately, be adequately reviewed in the space at one's disposal. It is interesting to note that goats can "accommodate" the virus and provide an easy means of transporting it from one outbreak to another without much danger of communicating the disease *en route*. In this way, also, the risk of redwater is avoided. The attenuation of the virus by passage through goats, first recorded by Edwards in India, was not observed in Tanganyika. Nasal swabbing was occasionally employed when facilities for other methods of inoculation were contra-indicated. In this manner reasonably satisfactory "takes" were obtained in from 50-75 per cent. of cases, the remainder of the herd contracting the disease by contact. Aberrant cases of the disease, in which the classical symptoms were entirely absent, are recorded; one observer finding that the fauces were often the only seat of characteristic ulceration and cheesy deposit. In some outbreaks the high degree of susceptibility in very young calves (from 17 days old) born of rinderpest-immune dams, was a remarkable feature.

Bovine pleuro-pneumonia was witnessed for the first time since the British administration of the Territory, and, by reason of its insidious onset and the difficulty in identifying "lungers," was often more difficult to control than rinderpest. East Coast fever was controlled by hand-dressing and dipping, but it is asserted that immunity to this disease as it exists in enzoötic areas, although the calf mortality may be as high as 60 per cent. to 70 per cent., "is of itself of considerable commercial value." But the disease is not enzoötic in the heavily-stocked arid and semi-arid areas of the Territory.

Nearly three-fourths of the Territory are infested with Glossinæ and trypanosomiasis caused by *T. congolense, T. vivax, T. brucei,* and in pigs *T. rodhaini* are frequently met with. Outbreaks occur in which the presence of the tsetse-fly is not detected, but "the mechanical transmission theory can only be accepted with reserve in many cases and of course only where cyclical infection is definitely ruled out." Attention is drawn to the fact that "on several of the islands of Lake Victoria, off Musoma, cattle and sheep graze freely amongst *G. palpalis* without any apparent ill-effects or discomfort—a fact which serves to remind us that it is the trypanosome which it harbours and not the 'fly' which constitutes the menace." Several stock-routes have had to be abandoned by reason of the "fly" and it is foretold that within a few years these "fly" areas will coalesce to form an ever-tightening strangle-hold on the stock areas, when effective reclamation will become almost impossible. In no instance has any recession of "fly" been reported.

Anthrax infection is ubiquitous, occurring in goats, sheep, cattle and donkeys. In Bukoba, out of 15 beasts which had succumbed to the

disease in one outbreak twelve were eaten by natives *without any untoward results.* Blackquarter is widespread and causes heavy losses in young cattle, but tuberculosis was only found in two cases, the Zebu cattle rarely becoming infected with this disease. Three outbreaks of foot-and-mouth disease are recorded. A few cases of rabies were suspected, but in no instance was diagnosis confirmed.

The reports of the Veterinary Laboratory on Research in Trypanosomiasis and Animal Nutrition make interesting reading, but cannot be dealt with in this note which has already exceeded the space allotted to it. Suffice it to say that every student of Tropical Veterinary Medicine and Hygiene should secure a copy of this interesting report from the Government Printer, Dar es Salaam, from whom it may be obtained for the sum of 4s.

Ll. E. W. B.

N.V.M.A. Divisional Report

LINCOLNSHIRE AND DISTRICT DIVISION*

SURGICAL DEMONSTRATIONS AT LINCOLN

The Autumn Meeting of the Lincolnshire Division, N.V.M.A., was held at the Albion Hotel, Lincoln, on Thursday, October 12th, the chair, in the temporary absence of the President, being taken by Major F. L. Gooch.

There were also present: Messrs. F. W. L. Gooch, J. H. Poles, F. H. Sugden, A. Logan, Geo. Gibson, W. Gibson, R. Swaby, W. S. Cartwright, H. Walpole, H. J. Hines, W. W. Lang, E. Porter-Smith, Geo. Eaton, Major A. N. Foster and Mr. Harry C. Reeks (Hon. Secretary.)

The minutes of the last meeting, having been published in the *Record*, were, on the proposition of the Chairman, seconded by Mr. Poles, taken as read.

Apologies for absence were received from Messrs. H. P. Standley, C. W. Townsend, R. W. A. Watchorn and W. W. Grasby. The Hon. Secretary informed the meeting that Mr. Watchorn and Mr. Grasby had, at the same time, submitted their resignations from the Society, Mr. Watchorn having left the district and Mr. Grasby finding it increasingly difficult to attend the meetings. Both resignations were accepted with regret.

Ballot for Membership.—Major A. N. Foster, O.B.E., M.R.C.V.S., having been proposed by Mr. Porter-Smith and seconded by Mr. Lang, was elected a member of the Society.

Alteration of Rules.—The Chairman said that the next business was to consider an alteration of Rule 4 of the Association, fixing the date of the June meeting. This had been brought forward by Mr. Poles at the Peterborough meeting, and he would ask Mr. Poles for some suggestions. He himself did not view with much favour any alteration in the fixed dates. If one once altered them, one might always be doing so.

Mr. Poles said that his only reason for suggesting a change was that the meeting on the second Thursday in June almost invariably clashed with the Huntingdonshire Agricultural Show, which was largely attended by members practising in that area. He would suggest that the meeting be held on the Wednesday immediately preceding the second Thursday in June.

After some discussion, this was put to the meeting and carried.

Royal Sanitary Institute Congress. — The Chairman now rose to say that since their last meeting he had, as in past years, attended the Congress of the Royal Sanitary Institute as their representative. The Congress had been a great success, and great interest had been shown in the Veterinary Section—but not, he was sorry to say, by veterinary surgeons. He ardently wished that more members of the profession would attend the Congresses, particularly at the present time, when the question of part- *versus* whole-time veterinary appointments was so much to the fore. Local authorities were taking a great interest in these questions and their delegates were present at the Congress. Members might find that, in the future, work which should be entrusted to the veterinary surgeon would be in other hands.

As a result of what he saw at the Congress, he did not think that whole-time veterinary appointments under local authorities would become general in the near future.

Surgical Demonstrations

A vote of thanks to the Chairman having been passed, the company proceeded to premises in Friar's Lane for a series of surgical demonstrations by the President, K. J. S. Dowland, Esq.

The demonstrator remarked that he was operating that afternoon with considerable diffidence, as he was well aware that what he was going to show them was perhaps rather "stale stuff"; however, all three operations were useful ones and it was always of advantage to see other people's procedures, even in the simplest matters.

Median Neurectomy.—The first operation to be shown was a median neurectomy. After briefly recapitulating the anatomy of the median nerve and the innervation of the leg below the knee, the demonstrator proceeded to state that this was a very easy operation, only two things being requisite to success. The first was an adequate extension of the radio-ulnar joint, obtained by freeing the leg from the hobbles and the application of firm traction to a side-line fixed around

* Received for publication November 8th.

the pastern. The second was the assurance of the arrest of hæmorrhage from the divided pectoralis muscles; the nerve and its surrounding tissues easily became blood-stained and thus indistinguishable from the adjacent structures.

This operation was further facilitated by the fact that the site of operation was unlikely to have been blistered or otherwise interfered with by previous treatment. The main indications were a chronic lameness, resistant to other treatment, of the sesamoidean sheaths and their adjacent structures.

The operation was then performed. Mr. Gibson, of Grantham, remarked that he had had great experience of this operation and endorsed the demonstrator's opinion of its value. He stated that it was useful in certain cases of chronic sprain of the back tendons; and went on to emphasise the necessity of at least five or six weeks' rest after the operation, the subject being turned out, to enable the unnerved tissues to accommodate themselves to the change.

Posterior Digital Neurectomy.—Before performing posterior digital neurectomy, the demonstrator stated that this operation was of great value in navicular disease and chronic aseptic conditions involving the navicular bursa and adjacent structures. The operation was rather "tricky," particularly if the site of operation had been much altered by previous remedial measures applied over the area. The anatomy of the part was then discussed and the operation performed.

Ovariotomy.—The operation of ovariotomy in the kitten was then demonstrated and discussed, Mr. Hudson, of Retford, taking part and describing his method of treating the abdominal wound.

After the demonstrations the members were entertained to tea by Mr. and Mrs. Dowland.

H. C. Reeks, junr., *Hon. Secretary.*

In Parliament

The following questions and answers have been recorded in the House of Commons recently:—

Light-Horse Breeding (Grants)

Colonel Clifton Brown asked the Financial Secretary to the War Office if he is satisfied that the effect of the withdrawal of the light-horse breeding subsidy borne until recently on the Vote of his Department is in the best interests of the country; and, if not, will he state what measures he proposes to adopt to remedy the situation?

Mr. Cooper: My hon. and gallant Friend is probably aware that the grants for the encouragement of light-horse breeding were discontinued solely on the ground of economy. The question of the resumption of a grant from Army funds is under consideration, but I am unable at present to give any indication as to whether it will be found possible to make a grant.

Mr. Smithers: May I ask whether, if it is not found possible to continue the whole of the grant, they will continue as much of it as is possible?

Mr. Cooper: That possibility will certainly be taken into consideration.

At a later date, Mr. Joel asked the Minister of Agriculture if, in view of the anxiety of breeders as to the Government's policy, he can now make a further statement with regard to the result of his negotiations with the War Office in connection with horse breeding?

The Minister of Agriculture (Mr. Elliot): Following discussions between the Departments concerned the Government have now decided that the cost of the grant for light horse breeding, which was transferred in 1923 to the War Office from the Ministry, should not be re-transferred. Any question as to the renewal of the grant is, therefore, one for my hon. Friend the Financial Secretary to the War Office.

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Racecourse Betting Act and Horse-breeding

Captain Peter MacDonald asked the Home Secretary whether, in view of the fact that no sums have yet been made available for the benefit of British horse-breeding and charity, as provided by the Racecourse Betting Act, 1928, he will take steps, in any future legislation dealing with lotteries and betting, to remedy this defect?

Sir J. Gilmour: As the House is aware, the recommendations of the Royal Commission on Lotteries and Betting are engaging the close consideration of the Government, and my hon. and gallant Friend will not expect me to say more than that all relevant suggestions for amending the law will receive careful attention.

Captain MacDonald: Will the right hon. Gentleman say what provision has been made for this purpose by the Control Board in all the years that the Act has been in operation?

No answer was given.

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Performing Animals (Regulation) Amendment Bill

Mr. Liddall asked the Home Secretary if the Government will introduce the Performing Animals (Regulation) Amendment Bill, debated in another place on May 4th, 1933?

Sir J. Gilmour: No, Sir.

Mr. Liddall: Is the right hon. Gentleman aware that when this Bill was defeated in another place, the Government promised that further action would be taken?

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Osteopathy

Mr. Hall-Caine asked the Minister of Health whether he will consider the desirability of appointing a committee to consider what steps, if any, should be taken to control and regularise the activities of osteopaths in the interests of the public?

Mr. Shakespeare: My right hon. Friend does not as at present advised think that any public interest would be served by the appointment of such a committee.

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Milk Consumption

Sir Murdoch McKenzie Wood asked the Minister of Agriculture what is the *per capita* consumption of milk in the principal cities of Great Britain compared with the consumption in cities in the United States, the Scandinavian countries, and any others for which particulars are available?

Mr. Elliot: I regret that there is no information available, so far as I am aware, more recent than that in a report on the Fluid Milk Market in England and Wales, published in 1927 as one of the Ministry's Economic Series of Reports (No.

16). Tables showing the estimated *per capita* consumption of milk per day in the principal towns in England and Wales, and in certain countries, including the United States and the Scandinavian countries, are given on pages 109 and 131, respectively, of the report, but I should point out that the figures there given relate to years as far back as 1920 and 1923.

Sir M. Wood: Does not the right hon. Gentleman think it advisable to bring these figures up to date?

Mr. Elliot: All these things require expense, and my right hon. Friend objected a great deal to the amount of expense which is incurred in connection with these statistical returns.

Sir Herbert Samuel: Is there any additional expense involved in obtaining this information from our Consuls?

Mr. Elliot: It is one thing to get average figures, but my right hon. Friend will appreciate that to get accurate figures of this kind would require a little more than a simple inquiry from our Consuls.

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

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DIARY OF EVENTS

Dec. 11th.—Meeting of the Editorial Committee, N.V.M.A., at 2, Verulam Buildings, Gray's Inn, W.C.1, at 4.30 p.m.

Dec. 11th.—R.C.V.S. Oral Examinations commence.

Dec. 13th.—All Changes of Address to be notified to Registrar, R.C.V.S.

Dec. 15th.—Meeting of the Southern Counties Division, N.V.M.A., at Salisbury.

Dec. 15th.—Meeting of the Lancashire Division, N.V.M.A., at Manchester.

Jan. 3rd, 1934.—R.C.V.S. Committee Meetings.

Jan. 4th.—Ditto.

Jan. 4th.—Victoria Veterinary Benevolent Fund Council Meeting.

Jan. 5th.—R.C.V.S. Council and Committee Meetings.

July 30th-Aug. 3rd, 1934.—National Veterinary Medical Association Congress, Edinburgh.

Aug. 13th-18th, 1934.—Twelfth International Veterinary Congress, New York.

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PERSONAL

Blairgowrie Agriculturists to Honour N.V.M.A. President

"In the Blairgowrie district much satisfaction was felt at the election of Mr. William Nairn, M.R.C.V.S., Blairgowrie, as President of the National Veterinary Medical Association of Great Britain and Ireland," says *The Scottish Farmer* of November 25th. "A meeting of Blairgowrie district farmers was recently held, when the suggestion was made that public recognition should be made of that appointment and also of Mr. Nairn's valued services to the agricultural community, and it was with much cordiality approved. A committee was formed and they arranged to organise a complimentary dinner and presentation to Mr. Nairn in the Queen's Hotel, Blairgowrie, on Friday, December 15th. Mr. J. M. Hodge, convener of the county of Perth, has agreed to preside and make the presentation."

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R.S.P.C.A. Thanks Veterinarian Electrical Stunning Exponent

At a meeting of the Council of the R.S.P.C.A. held on November 23rd, the following resolution of the Humane Slaughtering Committee was confirmed, with the added thanks of the Council: "That a hearty vote of thanks be sent to Mr. Tweed for his very valuable advice and assistance to Mr. Paddison and the two demonstrators for the information given them in the principle and practice of electrical stunning."

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Appointments.—Dr. L. Jordan, Ph.D., M.R.C.V.S., Veterinary Pathologist to the Hannah Dairy Research Institute, has been appointed County Veterinary Officer for West Sussex.

Mr. W. A. Milligan, M.R.C.V.S., D.V.S.M., has been appointed Assistant Veterinary Officer to the West Riding County Council, in place of Mr. S. B. Vine, M.R.C.V.S., resigned.

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Colonial Officers on Leave.—Mr. N. Burke, M.R.C.V.S., Veterinary Officer, Nigeria, and Mr. G. F. Elliott, M.R.C.V.S., District Veterinary Officer, Northern Rhodesia, are on leave.

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ARMY VETERINARY SERVICE

Territorial Decoration

Amongst the officers upon whom the King has been graciously pleased to confer the Territorial Decoration under the terms of the Royal Warrant dated October 13th, 1920, is Major T. W. M. Cameron (R.A.V.C., Territorial Army Reserve of Officers). [Dr. Cameron (late of the "Dick" College, Edinburgh) is now Professor of Parasitology, McGill University, and Director, Institute of Parasitology, MacDonald College, Quebec, Canada.]

London Gazette—War Office—Territorial Army

December 1st.—Lieut.-Colonel P. W. Dayer Smith, O.B.E., T.D. (since retired) to be Bt. Colonel (December 2nd).

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BIG SHEEP SCAB OUTBREAK IN NORTHERN ENGLAND

The Ministry of Agriculture and Fisheries has issued an order relating to an outbreak of sheep scab in a large area which includes Stocksbridge, Deepcar, Penistone and Langsett, and other areas in the Sheffield district, and which extends into Lancashire and Cheshire.

Officials of the Ministry have taken up quarters at Huddersfield, where they will remain until the expiry of the order, which states that all sheep in the area must be dipped with an anti-sheep scab solution between December 1st and December 31st.

The outbreak has spread rapidly since November 14th, and strong steps are being taken to suppress it.

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GLASGOW COLLEGE PRIZE-GIVING

The prizes won by the students of the Glasgow Veterinary College during the last session were distributed by Mr. A. A. Hagart Speirs, of Elderslie, at a meeting, on November 25th, within the College in Buccleuch Street. Mr. Alexander

Murdoch, c.a., Chairman of the Governors, occupied the chair.

The Chairman, having referred to the great loss which the College had sustained since the last distribution of prizes by the death of their Chairman, Professor Glaister, remarked that the College continued to flourish owing to the support it was receiving from the various public bodies in the vicinity of Glasgow, and also to the financial assistance it was receiving from friends of the College and from institutions which were closely allied to it.

The following were the awards:—

Five-Year Course (1st Year)

Duncan S. Campbell—H. and A. S. silver medal in chemistry, and the College 1st class certificates of merit in chemistry and biology.

John Wharrier—H. and A. S. silver medal in biology, and the College 1st class certificates of merit in chemistry and biology; also the special prize of one guinea presented by Professor Macqueen for the best kept laboratory book in practical biology.

John Macdonald—H. and A. S. silver medal in animal husbandry I., and the College 1st class certificate in animal husbandry I.

John Birrell—College 1st class certificate in animal husbandry I. (He also gained 2nd honours in the professional examination.)

The College 1st class certificates of merit were also won by Messrs. Hugh M. Brown, Greenock; Archie K. Fraser, Lanark; Donald J. Macaulay, Lochmaddy; A. O. Merry, Glasgow; John G. Taylor, Balfron; and Andrew Wilson, Glasgow.

Four-Year Course (Class "B")

Fergus J. Hill—The gold medal presented by the Board of Governors to the student gaining the highest marks in the professional examination in anatomy, the H. and A. S. silver medal in senior anatomy, and the College 1st class certificates of merit in senior anatomy and physiology. (He also gained 2nd honours in the professional examination.)

J. J. Murdoch—H. and A. S. silver medal in physiology, and the College 1st class certificates of merit in senior anatomy and physiology. (He also gained 2nd honours in the professional examination.)

Robert M'Grath—H. and A. S. silver medal in stable management, and the College 1st class certificates of merit in senior anatomy and stable management.

R. N. C. Aitken—College 1st class certificates of merit in senior anatomy and physiology. (He also gained 2nd honours in the professional examination.)

Thos. F. F. Barr—College 1st class certificates of merit in senior anatomy and physiology.

James Bolton—College 1st class certificates of merit in senior anatomy and physiology. (He also gained 2nd honours in the professional examination.)

J. B. Brooksby—College 1st class certificates of merit in senior anatomy and physiology. (He also gained 2nd honours in the professional examination.)

D. M. Cochrane—College 1st class certificates of merit in senior anatomy, physiology, and stable management.

A. M. Fyfe—College 1st class certificate of merit in physiology.

James Geddes—College 1st class certificates of merit in senior anatomy, physiology, and stable management.

David Howie—College 1st class certificates of merit in senior anatomy and physiology.

T. A. Jackson—College 1st class certificate of merit in physiology.

J. R. Kerr—College 1st class certificate of merit in physiology.

V. J. S. Leslie—College 1st class certificate of merit in physiology.

J. L. Logan—College 1st class certificates of merit in senior anatomy and physiology.

D. I. MacAllister—College 1st class certificate of merit in physiology.

John M'Indoe—College 1st class certificate of merit in physiology.

John MacKinnon—College 1st class certificates of merit in senior anatomy and physiology.

David Moodie—College 1st class certificates of merit in senior anatomy and physiology. (He also gained 2nd honours in the professional examination.)

J. D. Paterson—College 1st class certificate of merit in physiology.

Alex. Shand—College 1st class certificates of merit in senior anatomy and physiology.

Ian B. Smellie—College 1st class certificate of merit in physiology.

H. B. Turkington—College 1st class certificate of merit in senior anatomy.

William Wilson—College 1st class certificates of merit in senior anatomy, physiology, and stable management.

D. W. Wyper—College 1st class certificates of merit in senior anatomy, physiology, and stable management. (He also gained 2nd honours in the professional examination.)

Class "C"

George Briggs—H. and A. S. silver medals in pathology and hygiene, and the College 1st class certificates of merit in materia medica and hygiene. (He also gained 2nd honours in the professional examination.)

J. G. Murray—H. and A. S. silver medal in materia medica, and the College 1st class certificate of merit in materia medica.

G. S. Donaldson—College 1st class certificate of merit in hygiene.

Miss M. G. Duff—College 1st class certificate of merit in hygiene.

D. M. M'Intyre—College 1st class certificate of merit in materia medica.

John M'Lintock—College 1st class certificates of merit in materia medica and hygiene.

A. H. Muir—College 1st class certificate of merit in materia medica.

W. D. Ross—College 1st class certificate of merit in hygiene.

Alex. Semple—College 1st class certificate of merit in hygiene.

Class "D"

The following passed their final professional examination and graduated M.R.C.V.S.:—

On December 15th, 1932.—Duncan Maclean, Balevullin, Tiree.

On July 21st, 1933.—T. P. Briscoe, Clydebank; J. A. Brown, Biggar; Alex. Chapman, Paisley; W. A. Gowans, Menstrie; David Harkness, Lanark; J. W. Macaulay, Glasgow; William Martin, Kilmarnock; Miss H. J. Mitchell, Glasgow; Miss M. L. Somervail, Glasgow; Archibald Steele, Dalry.

Miss H. J. Mitchell won the H. and A. S. silver medal in medicine, and the College 1st class certificates of merit in medicine and parasitology. Mr. David Harkness was awarded the H. and A. S. silver medal in surgery, and the College 1st class certificate of merit in surgery; while Mr. J. W. Macaulay gained the College 1st class certificates of merit in medicine and parasitology.